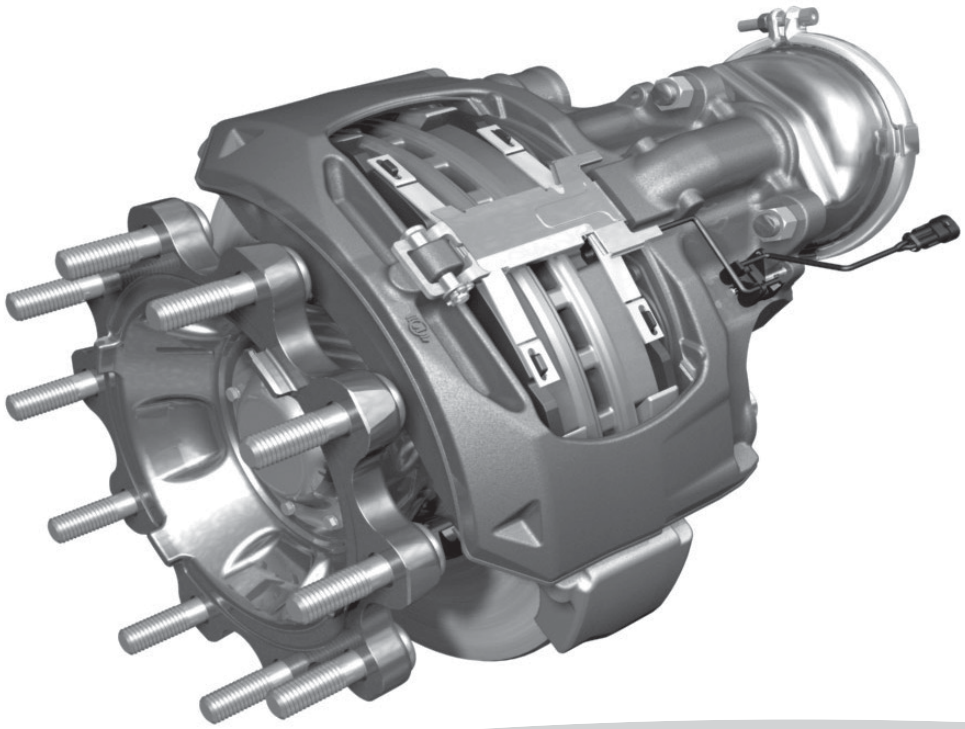
Commercial Vehicle Systems

Service Manual

Pneumatic Disc Brake
SN6 - SN7 - SK7



- Service kits
- Service tools
- Description/Function
- Service instructions

KNORR-BREMSE

Overview of Tool Kits and Service Manuals for Knorr-Bremse Air Disc Brakes

Brake	Tool Kit	Alternative
SB5...	II37951004	
SB6 SB7	II37951004*	
SN5	K004789	
SN6	K039062K50	K000469 + Supplemental Kit K017062 + Supplemental Kit K046291K50
SN7		K005972 + Supplemental Kit K017062 + Supplemental Kit K046291K50
SK7		K016947 + Supplemental Kit K046291K50
SL7... SM7...	K039062K50	K016947 + Supplemental Kit K046291K50

*) Additional tools are required -
obtainable in kits K000469, K005972, K016947 and K039062K50

Brake	Service Manual
SB6... SB7...	C16352-#
SN5...	Y015044-#
SN6... SN7... SX7...	Y006471-#
SL7... SM7...	Y081564-#

- Refer to website for latest revision **www.knorr-bremseCVS.com**

Disclaimer

The information contained in this document is intended for the exclusive use of trained persons within the commercial vehicle industry, and must not be passed on to any third party. All recommendations regarding products and their servicing or usage are with reference to Knorr-Bremse products and should not be considered applicable to products from other manufacturers.

This information does not purport to be all-inclusive and no responsibility is assumed as a result of its use. We cannot accept any liability nor offer any guarantee regarding data accuracy, completeness or timeliness. The information does not represent any guarantee or ensured characteristics of the Products or Systems described. No liability can be accepted based on the information, its use, recommendations or advice provided. In no event may we be held liable for any damage or loss except in the case of wilful intent or gross negligence on our part, or if any mandatory legal provisions apply.

Any legal disputes arising from the use of this information shall be subject to German law.

Note: If service work is carried out on the vehicle, it is the responsibility of the workshop to ensure the vehicle is fully tested and in full functional order before the vehicle is returned into service. Knorr-Bremse accepts no liability for problems caused as a result of appropriate tests not being carried out.

This disclaimer is an English translation of a German text, which should be referred to for all legal purposes.

Revision Details

Rev. 005	March 2013	Inclusion of previously withdrawn Rubber Bush (6a), Guide Pin (4a) and Cap (68a), tool T11 (K). Removal of reference to ADB22X, small text changes throughout.

Safety and Environment Guidelines 5

1. Overview 7

1.1 Disc Brake Components 7

1.2 Brake Identification and Service Kits 8

Wear Indicator Kits 9

1.3 Brake Disc 9

2. General Information 10

2.1 Service Tools 10

2.2 Diagnostic Equipment 10

2.3 Lubricant 10

2.4 Torque Requirements 10

3. Description and Function 11

3.1 Disc Brake Sectioned View 11

3.2 Description of Operation 12

Brake Actuation 12

Brake Release 12

Brake Adjustment 12

4. Inspection Points 13

4.1 Safety Instructions for Service Work and Repair Work 14

5. Functional and Visual Check 15

5.1 Wear Check of Pads and Brake Discs 15

Brake Pad/Disc Wear Check (on vehicle) with bearing variant (6a) 17

Brake Pad/Disc Wear Check (on vehicle) with bearing variant (6b) 18

Brake Pad/Disc Wear Check (on vehicle) using Carrier to Caliper position with bearing variant (6c or 6d) 19

Wear Indicators 20

Knorr-Bremse Diagnostic unit K154433N50 20

5.2 Adjuster Check 21

5.3 Caliper Check 23

Caliper Running Clearance 23

Caliper Movement along Guide Pins 23

Clearance Measurement of Bearing Variants (6) 24

5.4 Checking of Sealing Elements 25

Caliper Guide Pin Seals 25

Checking of Tappet and Boot Assemblies (13) 25

6. Brake Pad Replacement 26

6.1 Removal of Brake Pads 26

6.2 Fitting of Brake Pads 27

6.3 Fitting Pad Wear Indicators 28

Fitting of Cable Guide Variant (105) 29

Fitting of Cable Guide Variant (105a) 30

Fitting of Cable Protection Plate (104) 30

Contents

7. Tappet and Boot Assemblies (13) and Inner Seals (22) Replacement 31
7.1 Removal of Tappet and Boot Assemblies (13) 32
Inspection of Threaded Tube (16) 33
7.2 Replacement of Inner Seals (22) 33
7.3 Fitting of Tappet and Boot Assemblies (13) 34

8. Caliper Replacement. 37
8.1 Removal of Caliper from Carrier 37
Removal of Cover (10) 37
Removal of Cover (68c) or (68d) 38
Removal of Cap (68a) 38
Removal of Caliper 38
8.2 Fitting of Caliper to Carrier - (Carrier assembled on vehicle) 39
Fitting of Cover Variants 40
Cover Variant (10) - Long Bearing Side 40
Cap (68a) - Short Bearing Side 41
Cover Variant (68c) - Short Bearing Side 41
Cover Variant (68d) - Short Bearing Side 42
Fitting of Cover Variants with Caliper (1) and Carrier (2) removed from the vehicle . . . 42

9. Inner Boot (9) Replacement 43

10. Guide Pin Bush/Bearing Variants Replacement 45
10.1 Brass Bush (7) Replacement. 45
Removal of Brass Bush (7) 45
Fitting of Brass Bush (7) 45
10.2 Bearing Variants (6) Replacement 46
Removal of Bearing Variants (6) 48
Fitting of Bearing Variants (6) 49

11. Carrier Replacement 52

12. Brake Actuator Replacement 53
12.1 Removal of Knorr-Bremse Brake Chamber 53
12.2 Fitting of Knorr-Bremse Brake Chamber 53
12.3 Removal of Knorr-Bremse Spring Brake 54
12.4 Fitting of Knorr-Bremse Spring Brake 55

Safety and Environment Guidelines

Note: *The safety advice listed below is applicable to general service and diagnostic work on braking systems. Also observe any recommendations from the axle or vehicle manufacturer concerning towing, jacking-up and securing the vehicle.*

CAUTION: KNORR-BREMSE IS NOT LIABLE FOR ANY INJURIES OR DAMAGES CAUSED BY IMPROPER USE OF SPECIFIED SERVICE KITS AND/OR SERVICE TOOLS. FURTHERMORE, MISUSE OF TOOLS OR INCORRECT INSTALLATION OR APPLICATION OF SERVICE KITS MAY RESULT IN DAMAGE OR POTENTIALLY UNSAFE VEHICLE OPERATIONS. IN THIS CASE, KNORR-BREMSE DOES NOT HAVE ANY WARRANTY OBLIGATIONS.

Before and whilst working on or around compressed air systems and devices, the following precautions should be observed, along with the many hazard notes contained throughout the document:

1 Always wear safety glasses when working with air pressure.

2 Never exceed the vehicle manufacturer's recommended air pressures.

3 Never look into air jets or direct them at anyone.

4 Never connect or disconnect a hose or line containing pressure; it may whip as air escapes.

5 When removing or servicing a product, ensure all pressure related to the specific system it is contained in has been depleted to 0 bar. Be aware that if the vehicle is equipped with an air dryer system, it can also contain air pressure along with its purge reservoir, if fitted, even after pressure has been drained from the other reservoirs.

6 If it is necessary to drain the air pressure from reservoirs, etc., keep away from brake actuator push rods and levers since they may move as system pressure drops. On vehicles fitted with air suspension, it is advised when undertaking such work, to support the chassis from sudden lowering and therefore prevent any possibility of being trapped between the chassis and axle or ground.

7 Park the vehicle on a level surface, apply the parking brakes, and always chock the wheels as depleting vehicle air system pressure may cause the vehicle to roll.

8 When working under or around the vehicle, and particularly when working in the engine compartment, the engine should be shut off and the battery disconnected. Where circumstances require that the engine be running, EXTREME CAUTION should be taken to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components. Additionally, it is advisable to place a clear sign on or near the steering wheel advising that there is work in progress on the vehicle.

9 When working on vehicles equipped with air suspension, to guard against injury due to unexpected downward movement of the chassis caused by sudden pressure loss in the suspension system, ensure that the vehicle chassis is mechanically supported with a 'prop' between the chassis and the axle or between the chassis and the ground.

10 Examine all pipework for signs of kinks, dents, abrasion, drying out or overheating. Be aware that kinks in pipework may result in air pressure being trapped in the pipework and associated equipment. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems. Check the attachment of all pipework; it should be installed so that it cannot abrade or be subjected to excessive heat.

11 Components with stripped threads or damaged/corroded parts must be replaced completely. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle or component manufacturer.

12 Never attempt to install, remove, disassemble or assemble a device until you have read and thoroughly understood the recommended procedures. Some units contain powerful springs and injury can result if not properly dismantled and reassembled. Use only the correct tools and observe all precautions pertaining to use of those tools.

13 Before removing any device note its position and the connections of all pipework so that the replacement/serviced device can be properly installed. Ensure that adequate support or assistance is provided for the removal/installation of heavy items.

14 Use only genuine replacement parts, components and kits as supplied by Knorr-Bremse or the vehicle manufacturer. Only use the recommended tools as specified in related Knorr-Bremse instructions.

15 The serviced or replaced product must be checked for correct function and effectiveness.

16 If products have been dismantled, serviced or replaced, whose performance could affect braking performance or system behaviour, this should be checked on a roller dynamometer. Bear in mind that a lower performance may be experienced during the bedding-in phase if new brake pads/linings and/or brake discs/drums have been fitted.

17 The use of impact screwdrivers or impact wrenches in conjunction with Knorr-Bremse service tools for air disc brakes is not permitted. The service tools are not designed for such use. It is likely that the tools or the vehicle will be damaged and there is a serious risk of injury – see Caution above.

18 Do not use compressed air to clean the disc brake. Avoid air contamination of brake dust.

19 Prior to returning the vehicle to service, make certain that all components and the complete brake systems are leak free and restored to their proper operating condition.

Welding

To avoid damage to electronic components when carrying out electrical welding, the following precautions should be observed:

1 In all cases, before starting any electrical welding, remove all connections from any electronic control units or modules, noting their position and the order in which they are removed.

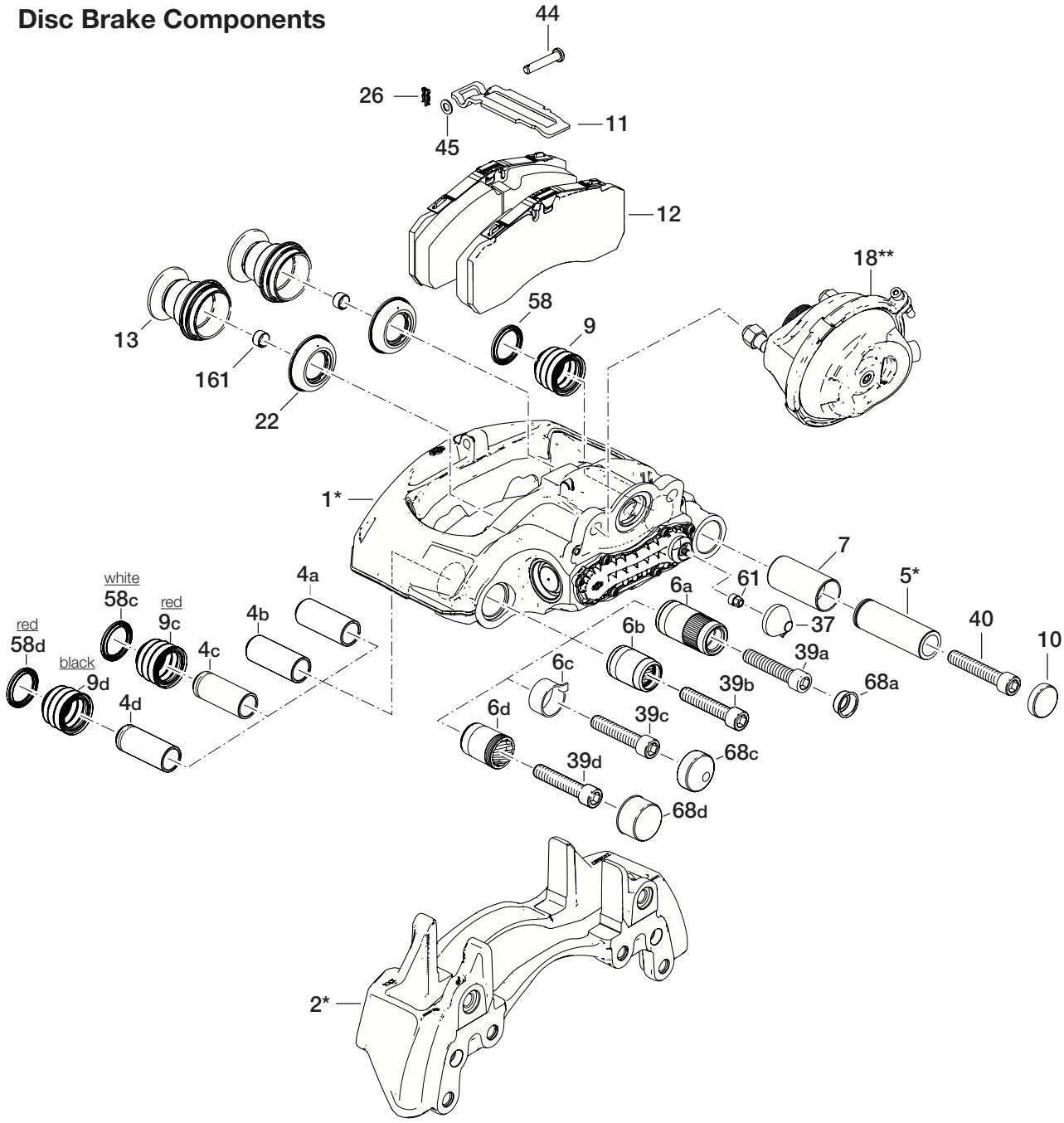
2 When re-inserting the electrical connectors (in reverse order) it is essential that they are fitted to their correct assigned position - if necessary this must be checked by PC Diagnostics.

Disposal of Waste Equipment by Business Users in the European Union

This symbol on the product, packaging or in user instructions, indicates that this product must not be disposed of with other general waste. Instead, it is your responsibility to dispose of the waste electrical and electronic parts of this product by handing them over to a company or organisation authorised for the recycling of waste electrical and electronic equipment. For more information about arrangements for waste equipment disposal please contact your Knorr-Bremse distributor or local Knorr-Bremse representative.

1 Overview

1.1 Disc Brake Components



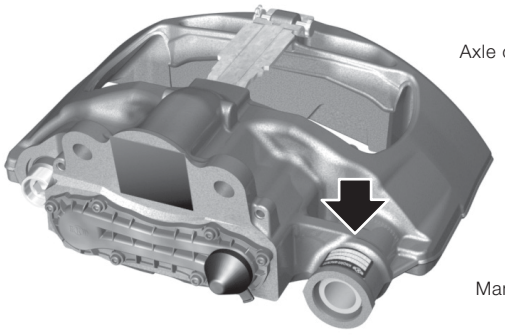
Legend

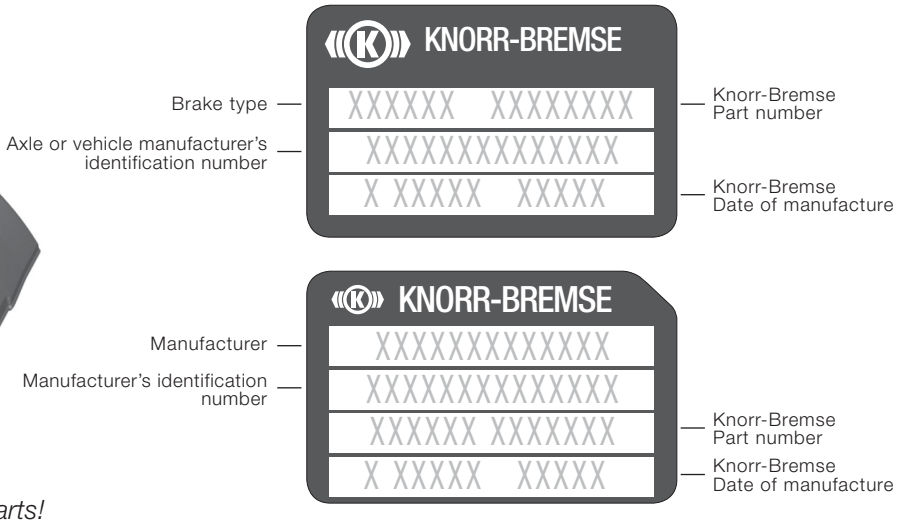
1	Caliper*
2	Carrier*
4	Guide Pin*
5	Guide Pin*
6	Rubber Bush or Guide Sleeve*
7	Brass Bush*
9	Inner Boot*
10	Cover*
11	Pad Retainer*
12	Pad (complete)*
13	Tappet and Boot Assembly
18	Brake Actuator**
22	Inner Seal*
26	Spring Clip
37	Adjuster Cap
39	Caliper Bolt*
40	Caliper Bolt*
44	Pad Retainer Pin
45	Washer
58	Ring*
61	Shear Adapter
68	Cover*
161	Tappet Bush

* Variants possible (see also contents leaflet in the service kit)

** Brake chamber or spring brake

1.2 Brake Identification and Service Kits





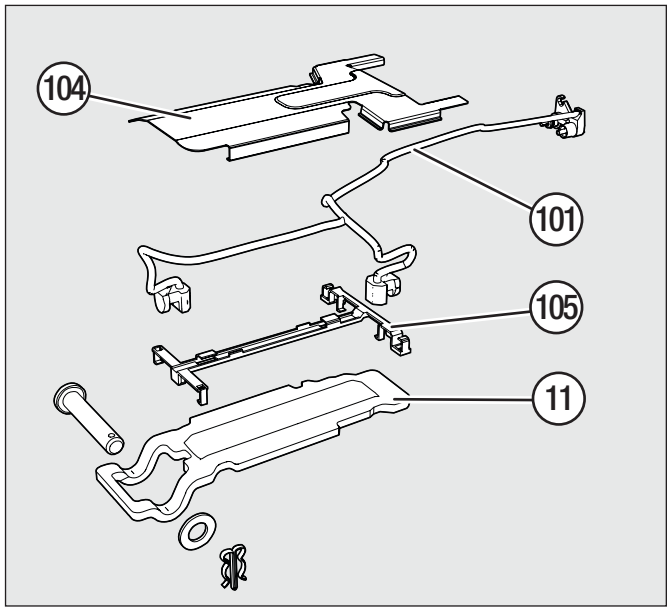
⚠ *Use only genuine Knorr-Bremse parts!*

The following service kits are available:

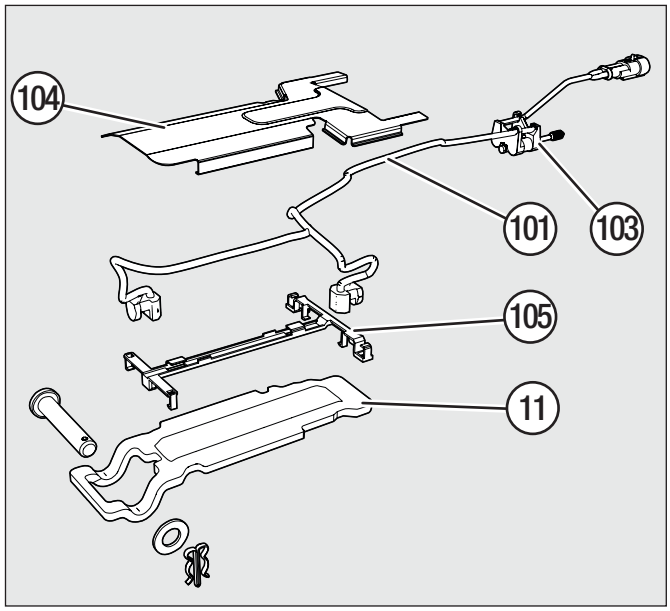
Description	Content (Position No.)	
Carrier	2	For specific service part numbers allocated to the disc brake see: www.Knorr-BremseCVS.com www.Knorr-BremseCVS.biz
Guide and Seal Kit	4a, 4b, 4c, 4d, 5, 6a, 6b, 6c, 6d, 7, 9c, 9d, 10, 39a, 39b, 39c, 39d, 40, 58c, 58c, 68a, 68c, 68d	
Tappet and Boot Kit	13 (2x), 22 (2x), 161 (2x)	
Adjuster Cap	37 (10x), 61 (10x)	
Brake Pads (axle set)	11, 12, 26, 37, 44, 45, 61	
Caliper	Supplied **without** carrier (2) and **without** brake pads (12). Guide Pins and Seals kit included for assembly of caliper to existing brake carrier	Knorr-Bremse offers a range of specifically designed rationalised calipers to service a wide range of disc brakes. For specific caliper part number, see: www.Knorr-BremseCVS.com www.Knorr-BremseCVS.biz

1.2.1 Wear Indicator Kits

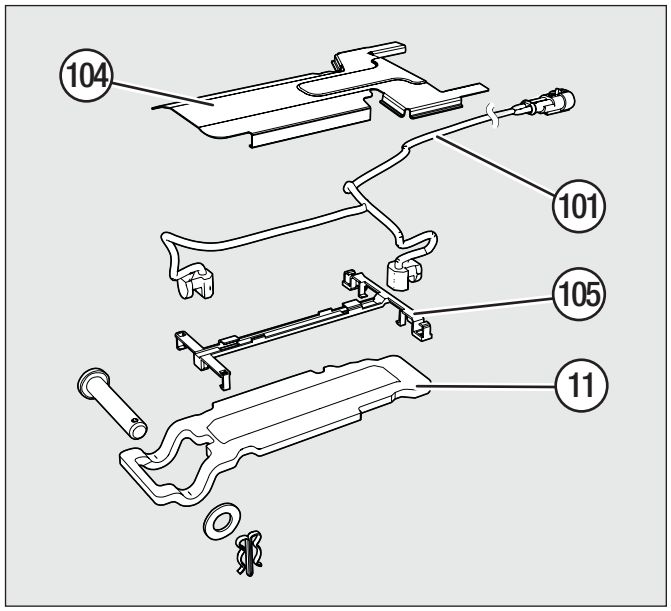
Type 1



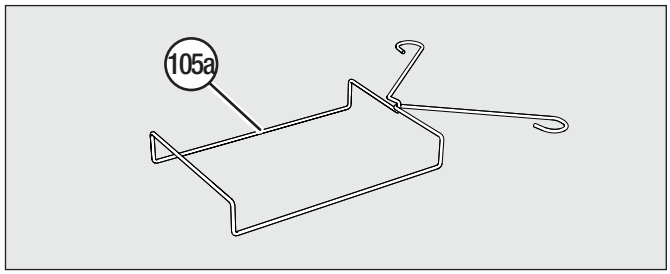
Type 2



Type 3



Alternative to Item (105)



11	Pad Retainer*
101	Sensors with cable*
103	Cable to electrical supply*
104	Cable protection plate
105	Cable guide
105a	Cable guide

* Variants possible

1.3 Brake Disc

Replacing brake discs is subject to the instructions of the Vehicle Manufacturer, including when fitting Knorr-Bremse brake discs.
When replacing brake discs, make sure to use the correct connections and tightening torques.

The use of non-approved brake discs will reduce levels of safety, and will not be covered by any Knorr-Bremse liability.
Knorr-Bremse recommends the brake disc be changed as an axle set. Brake discs can be ordered through the Knorr-Bremse aftermarket organisation.

2 General Information

The use of impact screwdrivers / impact wrenches in conjunction with Knorr-Bremse service tools for air disc brakes is not permitted. The service tools are not designed for such use.

Attention: Risk of injury. Knorr-Bremse accepts no liability for damage or injury resulting from negligence; any damage to service tools resulting from such actions will void all warranty.

2.1 Service Tools

Tool	Part No.	Description	Consisting of tool components:
(A)	II32202	Wedged fork for removal of tappet and boot assembly (13)	T15
(C)	Z004357	Pull-in tool for inner boot (9), rubber bush (6d)	T07, T08, T10
(D)	Z004354	Pull-in/Pull-out tool including grooving tool for brass bush (7)	T08, T12, T13, T14, T16
(E)	K046290	Press-in tool for tappet and boot assembly (13)	T02 T03, T04, T28, T55, T56
(H)	K015825	Press-in tool for cover (10)	T26
(K)	K003934	Press-in tool for cap (68a)	T11
(L)	Z004361	Press-in tool for inner seal (22)	T03, T04, T09
(M)	K016743	Press-in tool for cover (68c)	T27 (replaces T25)
(N)	K005986	Pull-in/Pull-out tool for guide sleeve (6c)	T05, T06, T08, T14, T20, T21
(R)	Z004198	Pull-in/Pull-out tool for rubber bush (6a) and (6b)	T05, T06, T18, T19,T20, T21, T22

Note: *The service tool kit (Part No.* ***K039062K50)*** *contains the above listed tools to service items* ***6, 7, 9, 10, 13 and 22****. English and German service manuals are also included. Customers who already own the service tool kit (Part No.* ***K016947)*** *may supplement this with the "Supplemental Tool Kit" (Part No.* ***K046291K50).***

The supplemental kit contains tools ***T02, T03, T04, T28, T55*** *and* ***T56****, as well as a revised service manual in English and German. For older tool kits, refer to the table on page 2.*

2.2 Diagnostic Equipment

Part No.	Description
K154433N50	A Knorr-Bremse hand-held device for checking potentiometer function (see also Service News Y123889).

2.3 Lubricant

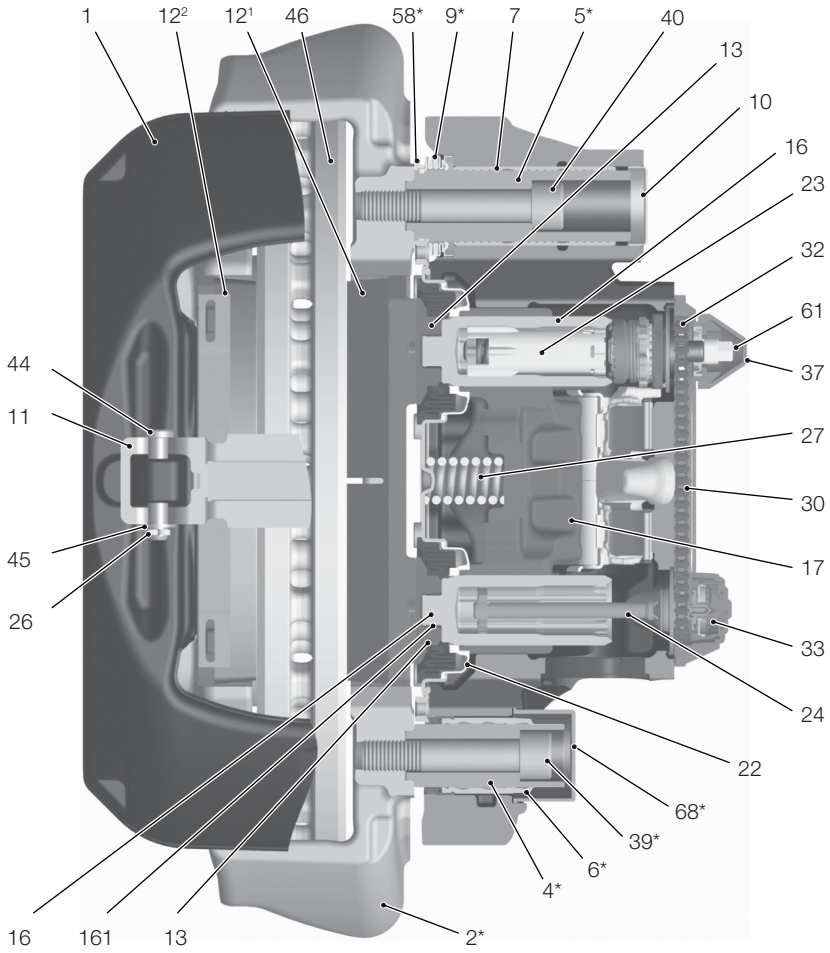
Part No.	Quantity
II14525	5g
K093430	10g
II32868	500g

2.4 Torque Requirements

Item No.	Description	Torque	Spanner Size (mm)
39; 40	Caliper bolts (2x) M16x1.5 (hexagon socket head)	180 Nm plus 90°	14 (Hexagon key)
18	Brake chamber or spring brake	Follow the instructions of the brake actuator or vehicle manufacturer	-

3 Description and Function

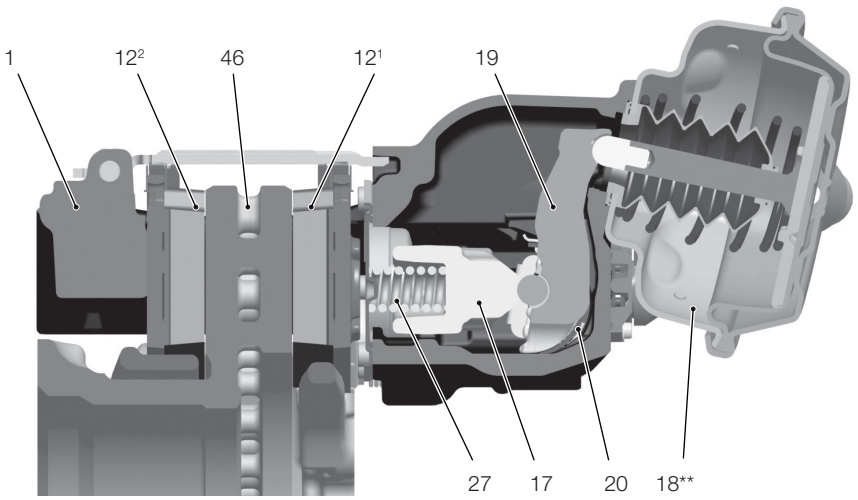
3.1 Disc Brake Sectioned View



Legend

1*	Caliper
2*	Carrier
4*	Guide Pin
5*	Guide Pin
6*	Rubber Bush / Guide Sleeve
7*	Brass Bush
9*	Inner Boot
10*	Cover
11*	Pad Retainer
12¹*	Pad (inboard)
12²*	Pad (outboard)
13	Tappet and Boot Assembly
16	Threaded Tube
17	Bridge
18**	Brake Actuator
19	Lever
20	Eccentric Bearing
22*	Inner Seal
23	Adjuster Unit
24	Turning Device
26	Spring Clip
27	Spring
30	Chain
32	Chain Wheel
33	Wear Sensor
37	Adjuster Cap
39*	Caliper Bolt
40	Caliper Bolt
44	Pad Retainer Pin
45	Washer
46	Disc
58*	Ring
61	Shear Adapter
68*	Cover
161	Tappet Bush

* variants
** Brake Chamber or Spring Brake



3.2 Description of Operation
(Floating caliper principle)

Brake Actuation

During actuation, the push rod of the actuator (18) moves the lever (19). The input forces are transferred via the eccentric roller bearing (20) to the bridge (17). The force is then distributed by the bridge (17) and the two threaded tubes (16) to the tappet and boot assemblies (13) and finally to the inboard pad (12[1]).

After overcoming the running clearance between the pads and the disc, the reaction forces are transmitted by the caliper to the outboard pad (12[2]). The clamping forces on the pads and the disc (46) generate the braking force for the wheel.

Brake Release

After releasing the air pressure, the return spring (27) pushes the bridge (17) with the threaded tubes and lever (19) back to the start position.

Brake Adjustment

To ensure a constant running clearance between pads and disc, the brake is equipped with a non-wearing, automatic adjuster mechanism. The adjuster (23) operates with every cycle of actuation due to the mechanical connection with lever (19).

As the pads and disc wear, the running clearance increases. The adjuster (23) and turning device (24) turn the threaded tubes (16) by an amount necessary to compensate for this wear.

The total running clearance (sum of clearance both sides of disc) should be between **0.6 mm** and **1.1 mm**; smaller clearances may lead to overheating problems.

4 Inspection Points

Despite the use of long-life materials, it is necessary to check some of the components regularly for their general condition. The following inspection points will ensure a long-life and trouble-free operation of the disc brake.

Every 3 months

The pad wear must be checked visually and independent of any wear indicator fitted to the vehicle (see Sections 5.1.1, 5.1.2).

With every pad replacement

It is important to check for the correct functioning of the adjuster (see Section 5.2) and the smooth operation of the caliper over its full range of movement (see Section 5.3). Also inspect the tappet and boot assemblies (13), the adjuster cap (37) and the sealing elements (9, 58) for correct fitting and condition as well as the caliper bearing in the area of the rubber bush/guide sleeve (6) (see Section 5.3.3).

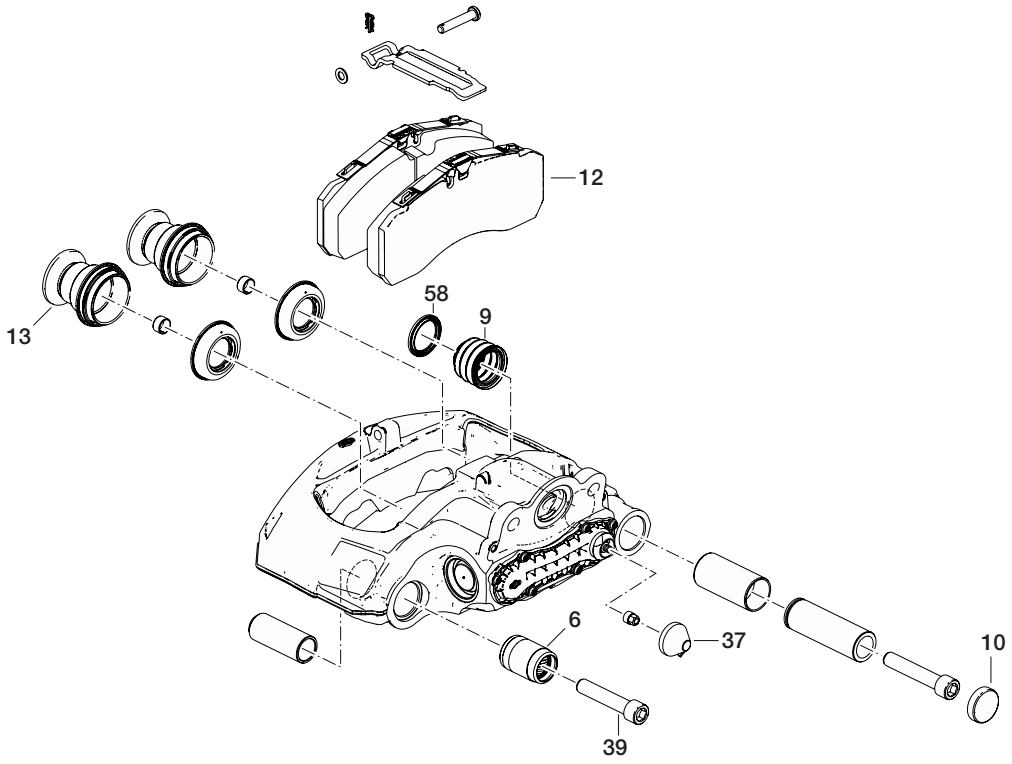
Annually

Check the caliper running clearance (see Section 5.3.1) and the correct fitting and condition of the cover (10), the adjuster cap (37) and cover (68c) or (68d) (depending on the bearing variant).

Note: These frequencies are a minimum and, depending on the vehicle application, a more frequent check of the components may be necessary.
Refer also to vehicle and/or axle manufacturer's instructions in regard to service intervals.

The discs should be checked according to the specification of the axle or vehicle manufacturer.

In the unlikely event of a problem, all relevant components must be returned in order that an objective investigation of the cause can be made.



4.1 Safety Instructions for Service Work and Repair Work

Observe relevant safety instructions for service work and repair work on commercial vehicles, especially for jacking up and securing the vehicle.

Use only genuine Knorr-Bremse parts.

⚠ *Before starting service work, ensure the service brake and parking brake, as well as the bus stop temporary hold brake, if fitted, are not applied and that the vehicle cannot roll away.*

Please follow service manual instructions and adhere to the wear limits of the pads and the discs (see Section 5.1).

Use only recommended tools (see Section 2.1).

Tighten bolts and nuts to the prescribed torque values (see Section 2.4).

⚠ *Screw threads and tapped holes must be free of lubrication and residuals of thread locking products.*

After re-fitting a wheel according to the vehicle manufacturer's recommendations, ensure that there is sufficient clearance between the tyre inflation valve, the caliper and the wheel rim, to avoid damage to the valve and the wheel.

⚠ *After any service work:*
Check the brake performance and the system behaviour on a roller dynamometer. Check function and effectiveness. Bear in mind that a lower performance can appear during the breaking-in phase of the brake pads and/or the brake disc.

Observe the "**Safety and Environment Guidelines**" section on pages 5 and 6.

5 Functional and Visual Check

5.1 Wear Check of Pads and Brake Discs

⚠ *For optimum safety, the pad and disc wear limits must not be exceeded.*

Brake Pads

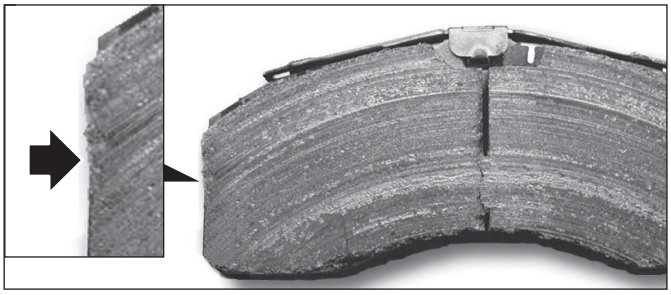
The thickness of the pads must be checked regularly dependent on the usage of the vehicle. The pads should be checked corresponding to any legal requirements that may apply. Even if a wear indicator is fitted and connected, this must be at least every 3 months.

5.1.1. Minor breakouts at the edges are permitted (see arrow).

5.1.2. Major breakouts on the surface of the brake pad are not permitted (see Fig.).

5.1.3. If the thickness of the friction material at its thinnest point is less than **2 mm** (dimension **C**) the pads must be replaced (see Fig.).
A = Overall thickness of new brake pad **30 mm**
B = Backplate - **9 mm** with SN6 and SN7
Backplate - **7 mm** with SK7 .
C = Minimum thickness of friction material **2 mm***
D = Minimum allowed thickness in worn condition for backplate and friction material:
- With a **9 mm** backplate **D = 11 mm***
- With a **7 mm** backplate **D = 9 mm***

*If these minimum allowed thicknesses are reached, brake pads must be replaced as an axle set.



5.1.1 - Brake pad with minor damage (permitted)

5.1.2 - Brake pad with major damage (not permitted)

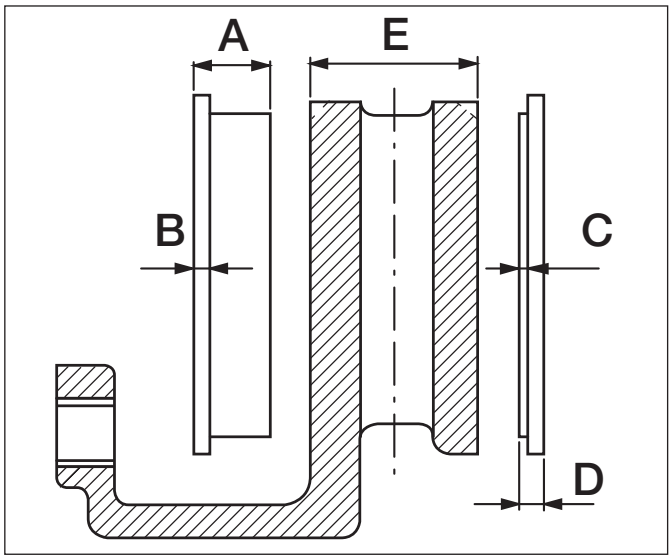
Brake Disc

Measure the thickness of the brake disc at the thinnest point. Be aware of possible burring at the edge of the disc.

E = Total thickness of the brake disc
new condition = **45 mm**
worn condition = **37 mm** (the disc must be replaced)

If the disc dimension **E ≤ 39 mm**, it is recommended that the disc should be renewed when the brake pads are changed.

⚠ *If these recommendations are ignored, there is a danger of brake failure and therefore increased risk of an accident.*



5.1.3 - Brake pad and disc thicknesses

5.1.4. Check the disc at each change of pads for grooves and cracks. If necessary replace the disc.

The figure shows possible surface conditions of the brake disc.

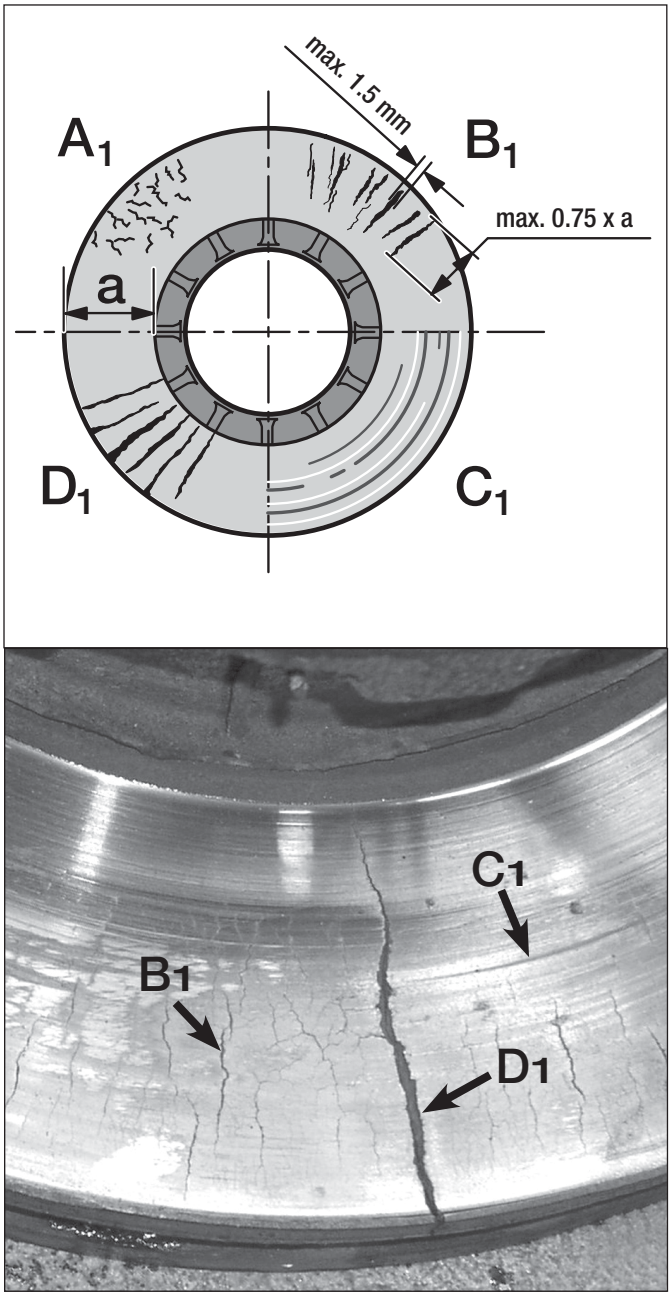
A_1 = Small cracks spread over the surface are allowed

B_1 = Cracks less than **1.5 mm** deep or wide, running in a radial direction are allowed

Cracks to a max. length of 0.75 x '**a**' are allowed (**a** = width of the friction ring)

C_1 = Unevenness of the disc surface less than **1.5 mm** deep is allowed

D_1 = Cracks going through to the cooling duct or onto the inner or to the outer edge of the friction ring are not allowed and the disc MUST BE REPLACED.



5.1.4 - Tolerances and examples of cracks and grooves on a brake disc.

Note:

In case of surface conditions A_1, B_1 or C_1, the disc can continue to be used until the minimum thickness **E = 37 mm** is reached.

Knorr-Bremse discs are normally service-free and grinding when changing pads is not necessary. However, grinding could be useful, e.g. to increase the load-bearing surface of the pads after severe grooving on the entire friction surface has occurred. To meet safety requirements, the minimum thickness after machining must be greater than **39 mm**.

In addition, the recommendations of the vehicle manufacturer about the machining of the brake disc MUST be followed.

Grinding of a Knorr-Bremse Splined Disc® is not allowed.

The adjacent picture shows some examples of cracks and grooves on a brake disc.

If these recommendations are ignored, there is a risk of an accident. If the brake pads and/or the brake disc are worn down excessively, brake performance will be reduced and may be lost completely.

Brake Pad/Disc Wear Check (on vehicle) with bearing variant (6a)

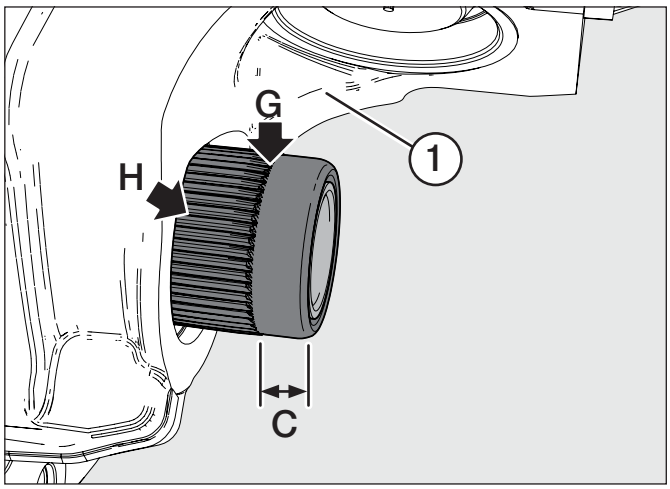
For all disc brakes equipped with rubber bush type (6a) with axial ribbing (see arrow **H**).

5.1.5. The pads/disc wear can be visually determined without removing the wheel, by noting the position of the wear marker point see arrow **G -** the change-over point from the ribbed to the smooth surface) (see Figs.).

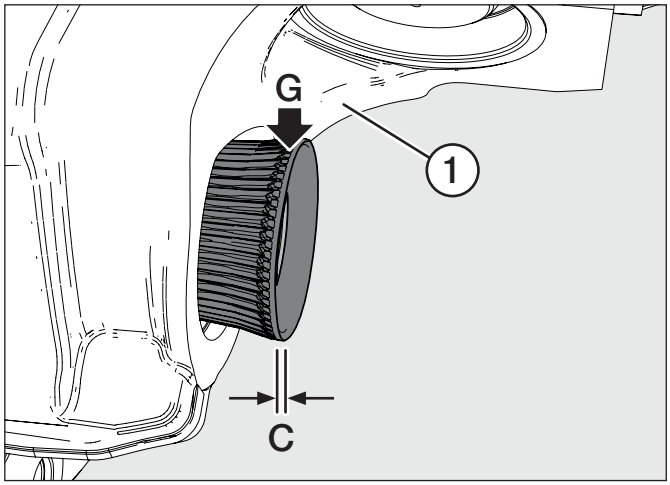
If dimension **C** is less than **1 mm**, the brake pad thickness and brake disc must be checked with the wheel removed (see Figs.).

If any minimal tolerance limits have been reached (see Section 5.1) the pads and/or disc must be changed.

Note: *Pads must be changed as an axle set (see Section 6). For disc replacement, follow vehicle manufacturer's recommendations.*



5.1.5a - Dimension **C** with new disc and brake pads



5.1.5b - Dimension **C** with worn disc/brake pads

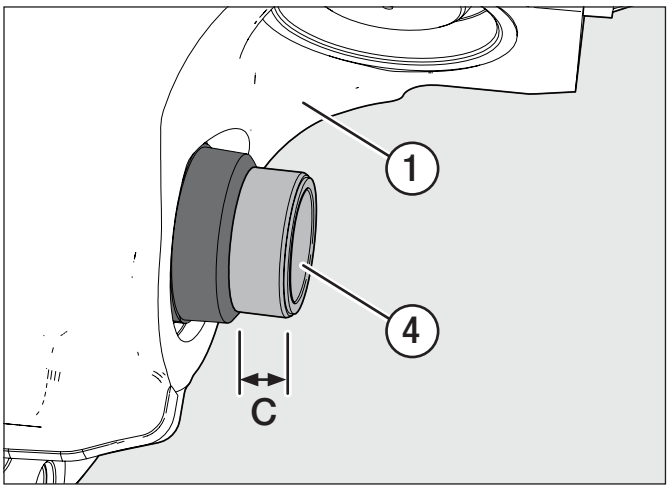
Brake Pad/Disc Wear Check (on vehicle) with bearing variant (6b)

5.1.6. The pads/disc wear can be visually determined without removing the wheel by checking the position of the caliper (1) compared to the fixed guide pin (4).

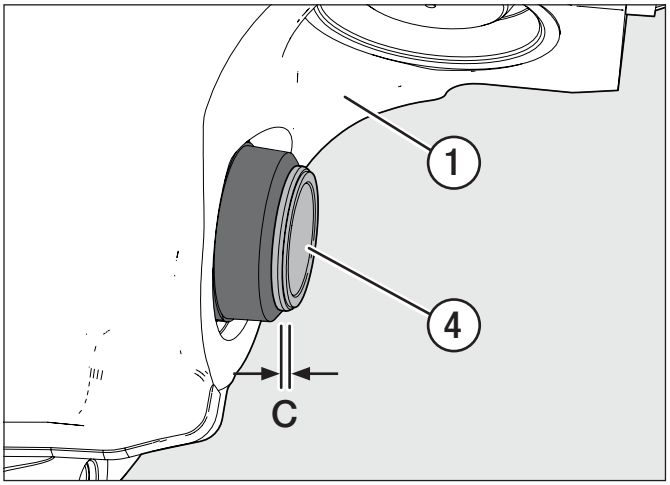
If dimension **C** is less than **1 mm**, the brake pad thickness and the brake disc must be checked with the wheel removed (see Figs.).

If any minimal tolerance limits have been reached (see Section 5.1) the pads and/or disc must be changed.

Note: *Pads must be changed as an axle set (see Section 6). For disc replacement, follow vehicle manufacturer's recommendations.*



5.1.6a - Dimension **C** with new brake pads and disc



5.1.6b - Dimension **C** with worn disc/brake pads.

Brake Pad/Disc Wear Check (on vehicle) using Carrier to Caliper position with bearing variant (6c or 6d)

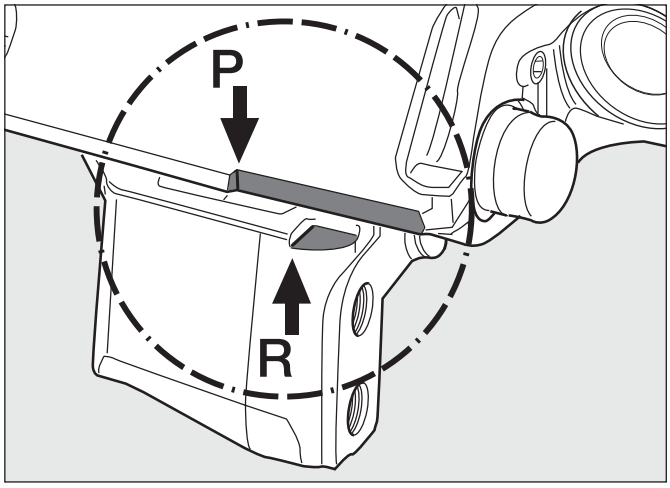
For all disc brakes which are equipped with a caliper to carrier marking.

5.1.7. The pad/disc wear can be visually determined without removing the road wheel by viewing the position of the caliper position **P** compared to the carrier marking **R** (see Figs.).

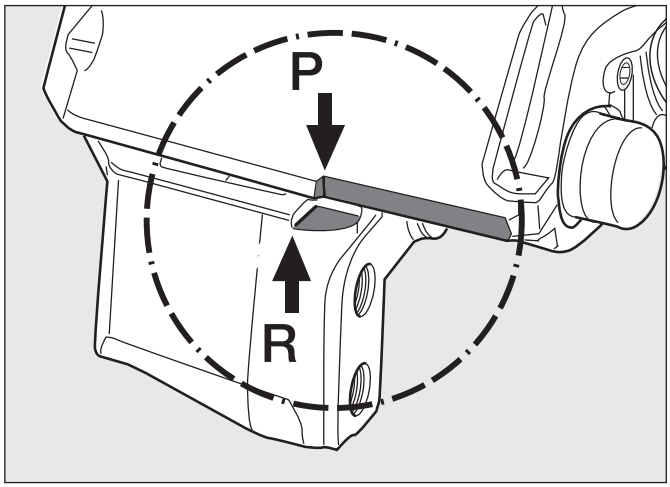
If the positions of P and R are similar to those shown in 5.1.7b, the brake pad thickness and the brake disc must be checked with the wheel removed (see Fig.).

If any minimal tolerance limits have been reached (see Section 5.1) the pads and/or disc must be changed.

Note: *Pads must be changed as an axle set (see Section 6). For disc replacement, follow vehicle manufacturer's recommendations.*



5.1.7a - Position of points P and R with new brake pads and disc



5.1.7b - Position of points P and R with worn disc/brake pads

Wear Indicators

5.1.8. Due to different vehicle manufacturers and vehicles there are several types of pad wear indicator used.

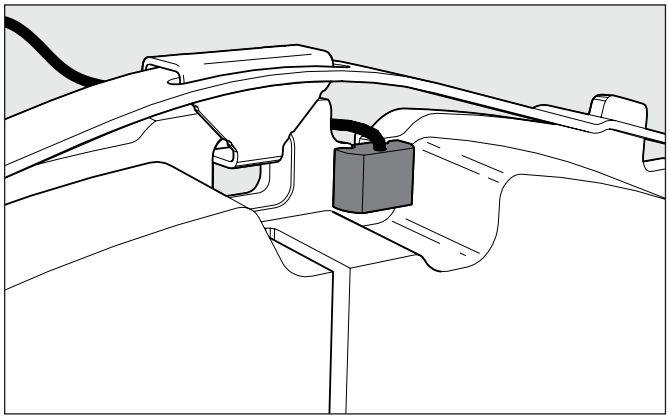
a) In-pad normally **closed** indicator - circuit is broken when pad wear reaches limit (see Fig.).

b) In-pad normally **open** indicator - circuit is made when pad wear reaches limit (see Fig.).

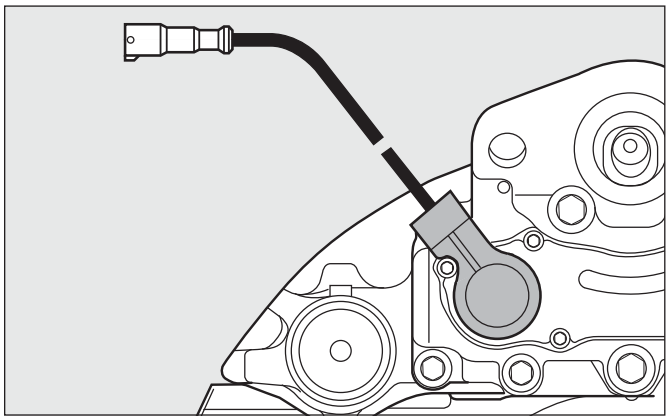
c) Wear indicator using built-in potentiometer. This is available either as an on/off version or as a continuous signal version which can be linked to the vehicle's electronic monitoring systems (see Fig.).

Either acoustic or optical diagnostic units can be connected.

Note: *Please also refer to specifications provided by the vehicle manufacturer.*



5.1.8a - 5.1.8b - In-pad wear Indicator



5.1.8c - Wear Indicator with built-in potentiometer

Knorr-Bremse diagnostic unit K154433N50

The Knorr-Bremse Potentiometer Tester serves;

- To test the Potentiometer function on Knorr-Bremse disc brakes
- To check the wear condition of the brake pads and brake discs

5.1.9. The Tester can be used on all current Knorr-Bremse brake types with continues or black/white Potentiometer.

Note: *Knorr-Bremse recommends that before replacing a brake caliper with a suspected potentiometer failure, that it first be tested using the Potentiometer Tester. If no defect is found, the cause is not with the brake caliper and therefore does not need replacing.*

5.1.9 - Knorr-Bremse diagnostic unit K154433N50

5.2 Adjuster Check

⚠ *Before starting work, ensure that the wheels are chocked and the vehicle cannot roll away.*

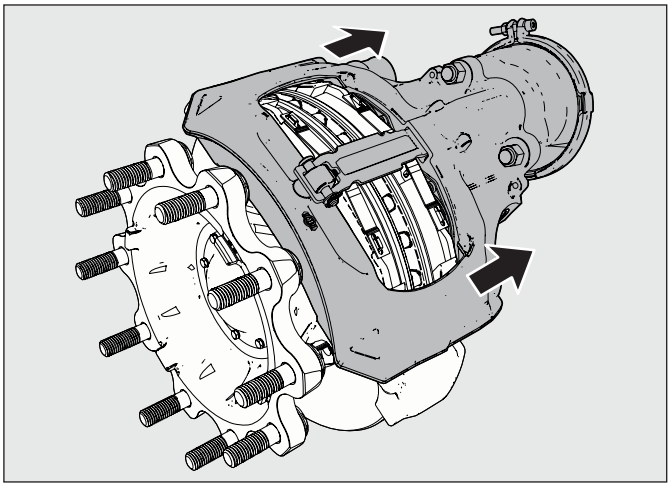
Ensure that service brake and parking brake, as well as bus stop temporary hold brake, if fitted, are in the released condition.

Remove wheel (refer to vehicle manufacturer's recommendations).

5.2.1. If, due to the orientation of the caliper on the axle, there is no danger of the brake pads falling out, remove the pad retainer (11) (see Section 6.1.2).

5.2.2. Push and pull caliper three times in axial direction to assess any existing air gap (see Section 5.3.1).

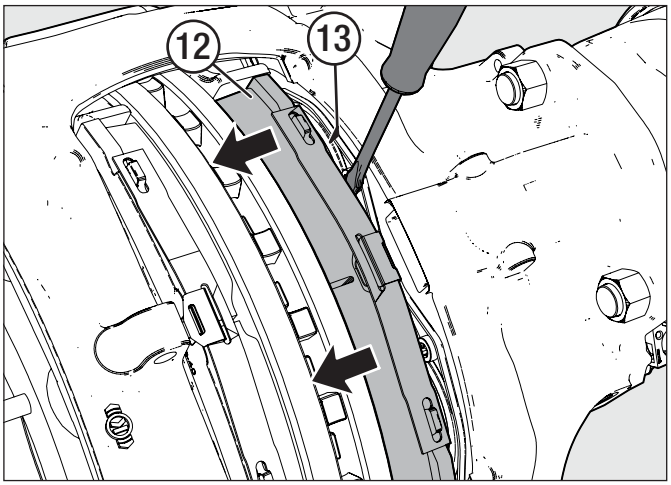
5.2.3. Push caliper inboard on its guide pins (see Fig.).



5.2.3 - Push caliper inboard

5.2.4. Using a suitable tool, lever the inboard pad (12) away from the tappets (13) (see Fig.).

⚠ *Make sure there is no dirt between the pad's backplate and the caliper contact surface, as this may lead to an incorrect measurement. Clean if necessary.*



5.2.4 - Press inboard pad away from tappets

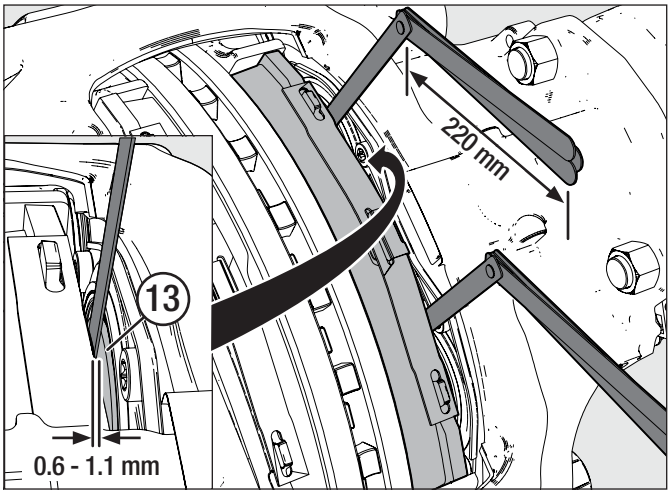
5.2.5. Check the gap between each of the tappets (13) and inboard pad backplate (12). This must be measured over the whole tappet surface of both tappets using two feeler gauges simultaneously (feeler gauges must be at least **220 mm** long) (see Fig.).

5.2.6. If the gap difference between the two tappets is **> 0.25 mm** then the caliper bearing clearance must be checked (see Section 5.3).

In addition each gap must measure between **0.6 - 1.1 mm.** If it does not, the adjuster may not be functioning correctly and should be checked as described in the following steps.

⚠ *If the clearance is too great, there is a danger of brake failure. If the clearance is too small, there is a danger of overheating that may lead to consequential damage.*

Note: *Please also refer to specifications provided by the vehicle manufacturer.*



5.2.5 - Check gap between tappets and inboard pad

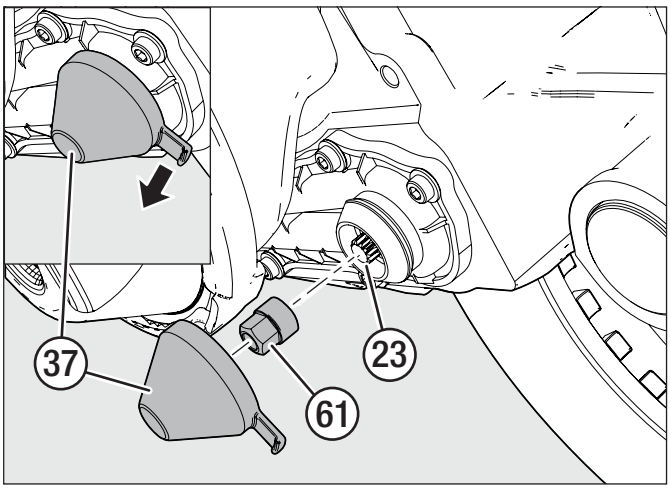
5.2.7. Pull off the adjuster cap (37) using the tag, taking care not to lose the shear adapter (61) (see Fig.).

⚠ *Removal of the adjuster cap (37) with a screwdriver, or similar, is not allowed since the seal may be damaged.*

5.2.8. The adjuster (23) must be turned with the shear adapter (61) anti-clockwise (viewed from actuator side) for **three clicks** (increasing running clearance).

⚠ *Never turn adjuster (23) without shear adapter (61) being fitted. If the shear torque of the shear adapter is exceeded, then it is designed to fail. Try again with a new (unused) shear adapter. With a second failure of the shear adapter the caliper must be exchanged since internal damage is present.*

***Do not** use an open-ended spanner as this may damage the adapter.*



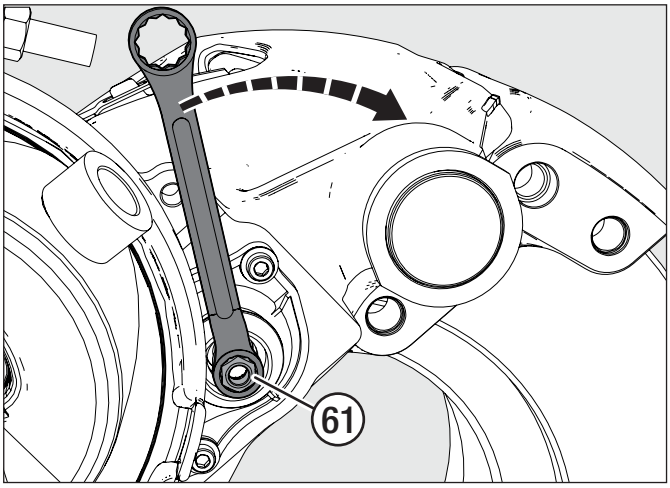
5.2.7 - Remove cap using the tag

⚠ *Make sure the ring spanner or socket can turn freely clockwise during the following procedure.*

5.2.9 By applying the brake (about 2 bar) 5 to 10 times the spanner or socket should turn clockwise (viewed from actuator side) in small increments if the adapter is functioning correctly (see Fig.).

***Note:** As the number of applications increases, incremental movement of the ring-spanner or socket will decrease.*

If the spanner or socket does not turn or turns only with the first application or turns forward and backward with every application, the automatic adjuster has failed and the caliper must be replaced.

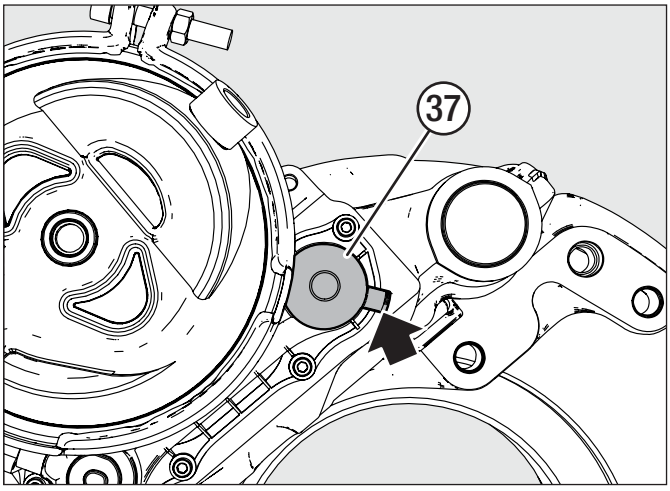


5.2.9 - Apply the brake 5-10 times, spanner turns clockwise

5.2.10. Lightly grease the contact surface of the cap with white grease (available as Part No. II14525 or II32868).

***Note:** A new adjuster cap (37) should be fitted even if the brake pads are not being replaced.*

The tag of the adjuster cap (37) should be positioned as shown by the arrow in the adjacent figure. This ensures access is maintained for subsequent removal (see Fig.).



5.2.10 - Tag positioning of the cap

5.3 Caliper Check

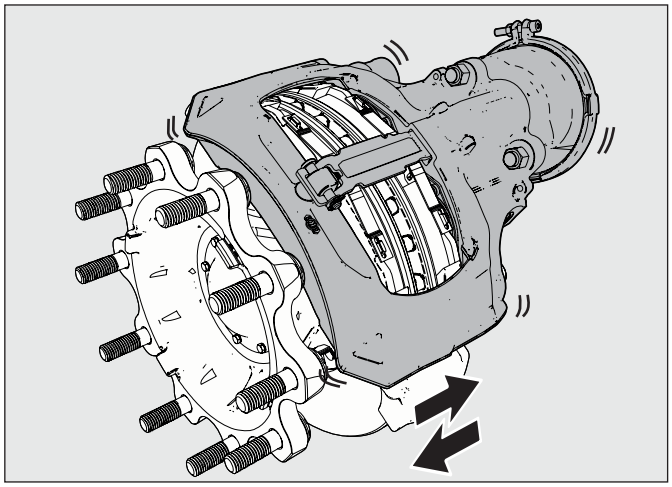
Caliper Running Clearance

⚠ *Before starting work, ensure that the wheels are chocked and the vehicle cannot roll away.*

Ensure that service brake and parking brake, as well as the bus stop temporary hold brake, if fitted, are in the released condition.

5.3.1. By pushing and pulling the caliper in an axial direction by hand, a movement within the running clearance (see Section 5.2) must be possible (see Fig.).

If, even using a high level of hand pressure (no tools), the caliper is not moveable the caliper guide pin seals must be examined (see Section 5.4).

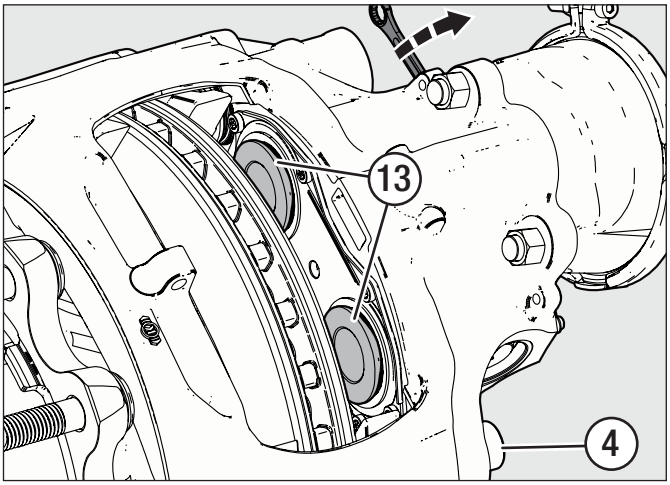


5.3.1 - Push and pull hand test

Caliper Movement along Guide Pins

5.3.2. Remove brake pads (see Section 6.1).

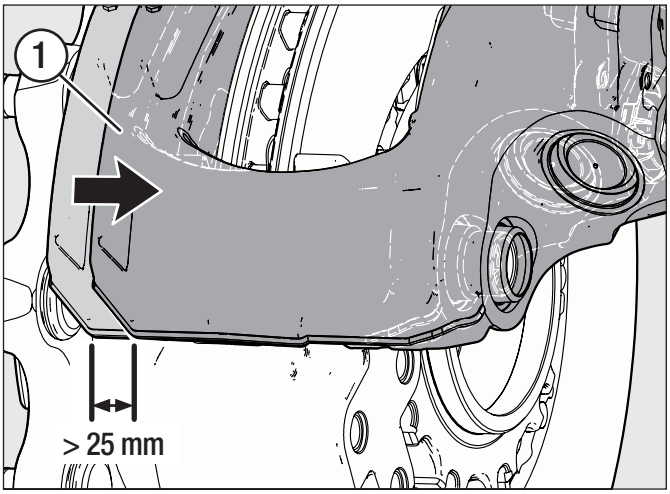
5.3.3. Rewind the tappets (13) completely back using a ring spanner and shear adapter (61). Clean dirt inside and out from guide bush (4) (see Fig).



5.3.3 -Rewind tappets completely

5.3.4. Caliper (1) must slide freely along the whole length of the guide pin arrangement; movement should be greater than **25 mm**. (see Fig.).

If the caliper does not move at least **25 mm**, the caliper guide pin seals must be examined (see Section 5.4).



5.3.4 - Free movement of caliper > **25 mm**

Clearance Measurement of Bearing Variants (6)

Note: *Before commencing (removing the wheel), make sure there is no contact between caliper and axle, vehicle, chassis sections or carrier.*

To measure the clearance, the following steps must be taken:

5.3.5. Remove the wheel, refer to vehicle manufacturer's recommendations.

5.3.6. Remove pad retainer (11) (see Section 6.1.2)

To achieve the correct reading it is necessary to have a pair of new brake pads fitted.

If the clearance measuring is not taking place during a brake pad replacement, the current position of the assembled pads must be noted, so that they can be re-assembled in the same position.

Remove old pads (see Section 6) (at this point Section 5.1 "Wear Check of Pads and Brake Discs" must also be observed).

Fit new pads (see Section 6).

5.3.7. Slide the caliper to the outboard position as far as possible (see Fig.).

5.3.8. Fasten a magnetic dial-gauge holder to the carrier (2) on the short bearing side of the caliper (1). Use the casting tag on the caliper (1) as the measuring point - see arrows **A** (see Fig.).

5.3.9. Set the dial-gauge to zero.

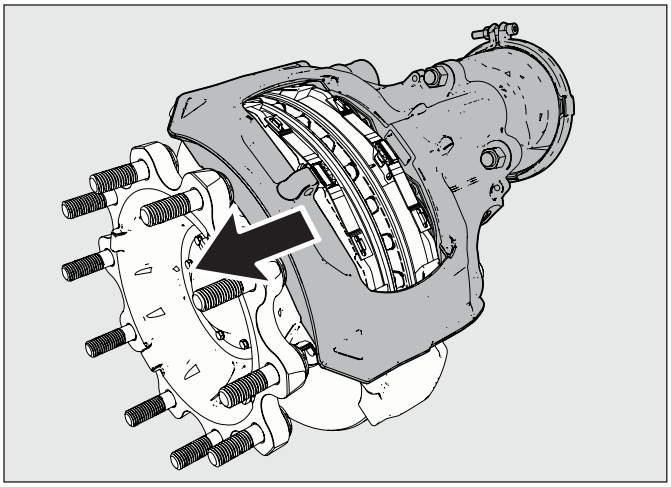
5.3.10. Place a suitable tool (e.g. screwdriver with at least 200 mm in length) in a central position between carrier (2) and caliper (1) and lever them in opposite directions (using normal hand-force) (see Fig.).

5.3.11. Read the maximum value of the bearing clearance on the dial-gauge and compare with the values in the table (see Table).

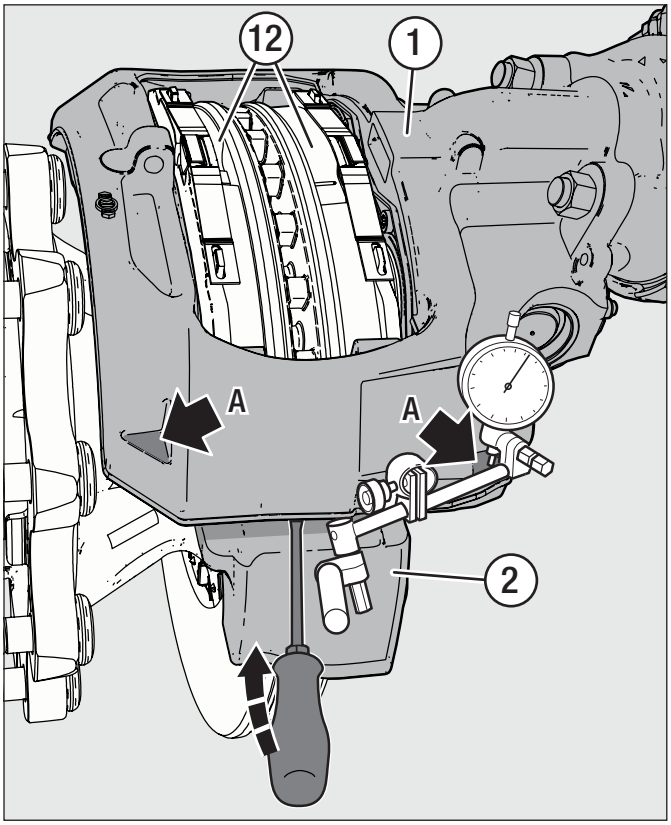
If the clearance exceeds the given tolerance, the complete bearing will need replacing using the relative service kit (see Section. 1.2 and Section. 10.2).

If the clearance measuring is not taking place during a brake pad replacement, the new pads should be removed and the previously marked brake pads fitted in their original positions (see Section 6).

5.3.12. Fit the wheel (refer to vehicle manufacturer's recommendations). After replacing the wheel check that it runs interference free.



5.3.7 - Slide caliper in outboard position as far as possible



5.3.9 - 5.3.10 - Obtaining maximum value of bearing clearance

Bearing variants (6)	Max. bearing clearance
6a	2 mm
6b	2 mm
6c	1 mm
6d	2 mm

5.3.11 - Maximum bearing clearance tolerances of bearing variants

5.4 Checking of Sealing Elements

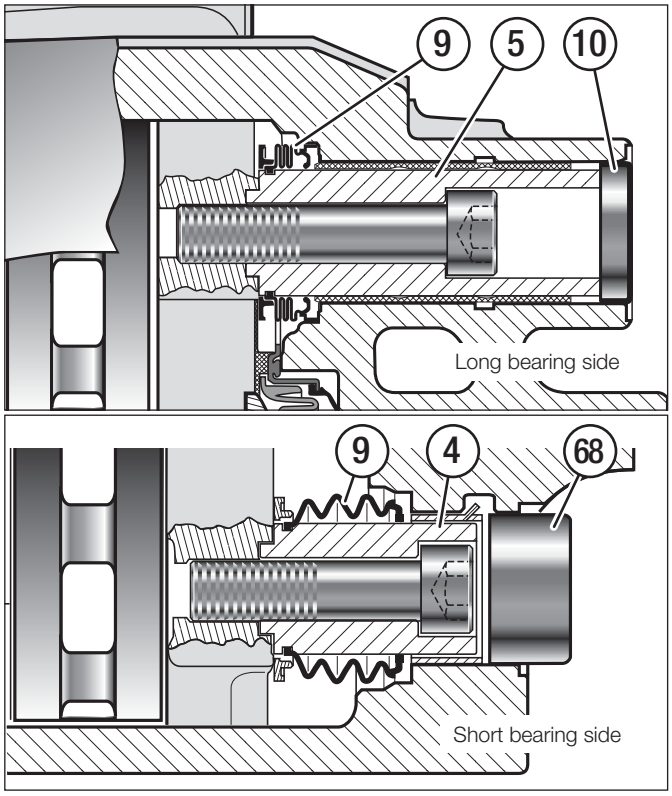
Caliper Guide Pin Seals

5.4.1. The guide pin (5) (as fitted to the long bearing side) is sealed with cover (10) and inner boot (9). The short bearing side with guide pin (4c or 4d) is also sealed with inner boot (9) and with cover (68c or 68d). The parts (9), (10), (68c) or (68d) must be free of any signs of damage (see Fig.).

Check for correct location and fitting.

If necessary, remove pads (12) to inspect the inner boots (9) (see section 6.1).

If necessary, repair caliper with suitable service kit (see Section 1.2 and Section 8).



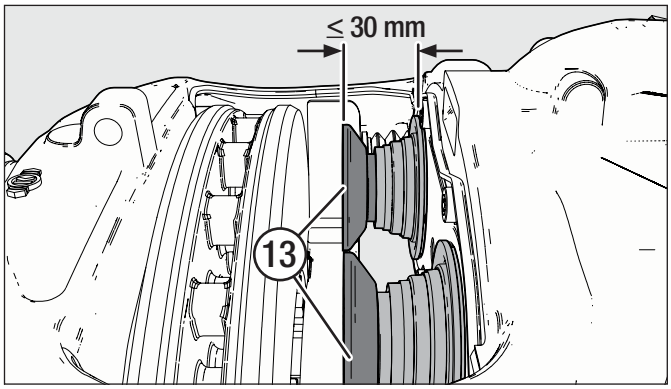
5.4.1 - Checking of guide pin and seals

Checking of Tappet and Boot Assemblies (13)

If necessary remove pads (12) (see Section 6.1).

5.4.2. Screw out the tappets (13) using the shear adapter (61) clockwise (see Section 5.2) until the boots are clearly visible (see Fig).

⚠ *The tappets must not be extended more than **30 mm**, otherwise synchronisation is lost and the caliper must be replaced.*



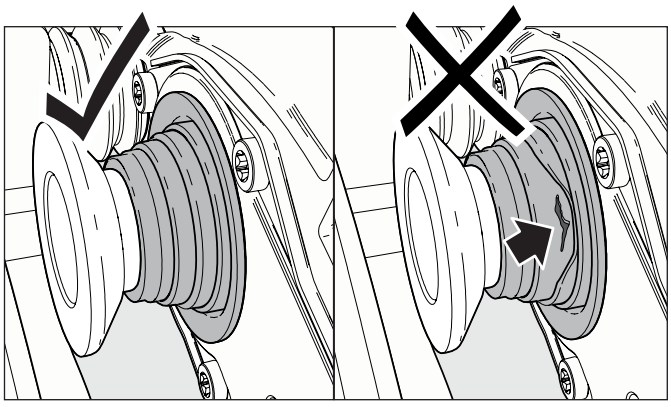
5.4.2 - Screw out tappets - max. **30 mm**

5.4.3. The rubber boots on the tappets (13) must not have any cuts/tears or show any other signs of damage (see Fig.).

Check for correct location and fitting.

Note: *The penetration of dirt and moisture into the brake will lead to corrosion and impair the function of the clamping mechanism and wear adjuster.*

If necessary replace tappet and boot assemblies (see Section 7).



5.4.3 - Check rubber boots for damage

6 Brake Pad Replacement

Before starting work, ensure that the wheels are chocked and the vehicle cannot roll away.

Ensure that service brake and parking brake, as well as bus stop temporary hold brake, if fitted, are in the released condition.

6.1 Removal of Brake Pads

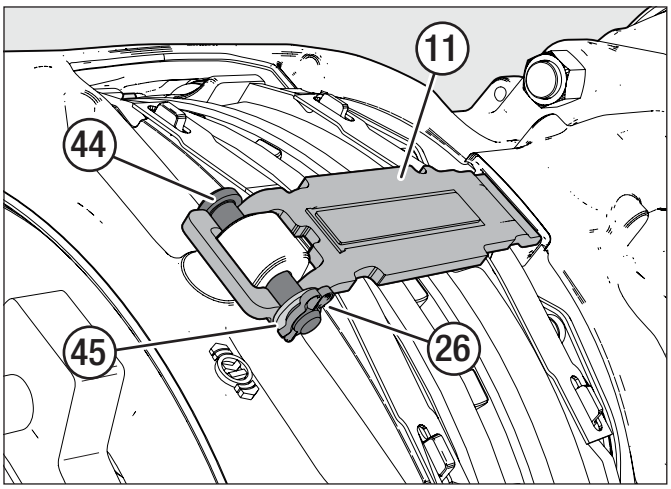
6.1.1. Remove wheel (refer to vehicle manufacturer's recommendations).

Important!
Before removing pads it is strongly recommended that the adjuster mechanism is checked for correct operation (see Section 5.2).

Depending on the orientation of the caliper on the axle, brake pads could fall out when removing the pad retainer (11).

6.1.2. Remove spring clip (26) and washer (45), depress the pad retainer (11) and remove pin (44) (see Fig).

If necessary remove any in-pad wear sensor components.

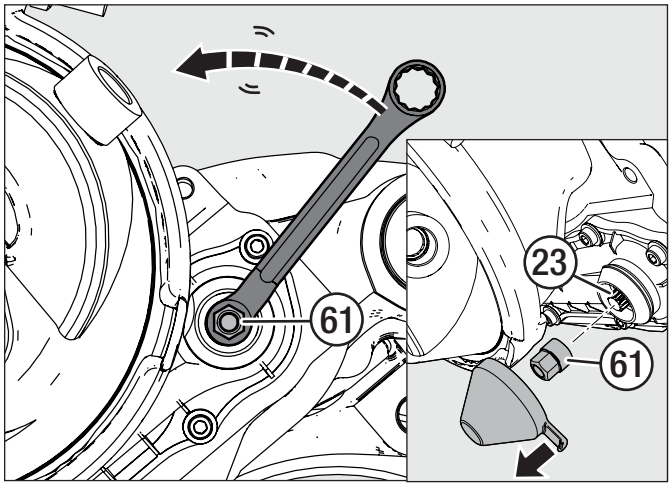


6.1.2 - Removing pad retainer

6.1.3. Pull off the adjuster cap (37) using the tab, taking care not to lose the shear adapter (61) (see Fig. insert).

Do not use any tools to remove the cap (37) as this can damage the sealing elements of the adjuster.

6.1.4. Fully wind back the tappet and boot assemblies (13) by rotating the shear adapter (61) in an anti-clockwise direction (as viewed from actuator side) (see Section 5.2) – a clicking noise is generated (see Fig.).



6.1.3 - 6.1.4 - Rewind adjuster using shear adapter

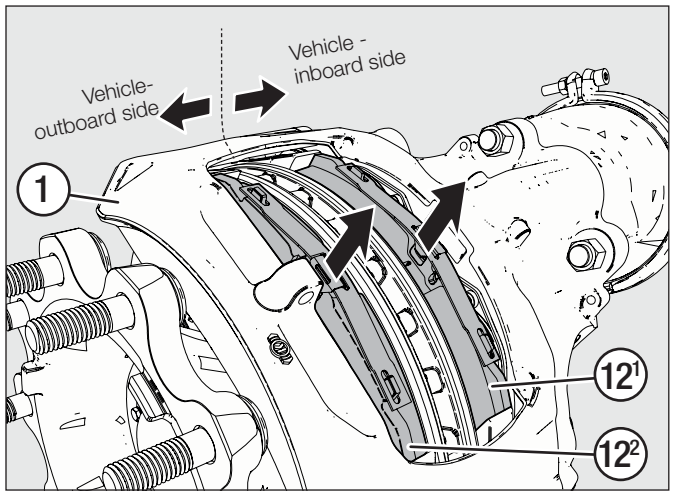
Never turn adjuster (23) without shear adapter (61) being fitted. If the shear torque of the shear adapter is exceeded, then it is designed to fail. Try again with a new (unused) shear adapter. With a second failure of the shear adapter the caliper must be exchanged since internal damage is present.

***Do not** use an open-ended spanner on the shear adapter!*

6.1.5. Remove brake pads (12^1) and (12^2) (see Fig.).

Note: The geometry of the brake pad housing of SK7 disc brakes require the following removal procedure of the brake pads (12):

- Pull caliper (1) towards the outboard side.
- Remove outer brake pad (12^2)
- Push caliper (1) to the inboard side.
- Remove inboard brake pad (12^1)



6.1.5 - Remove brake pads

6.2 Fitting of Brake Pads

⚠ *Pads must be changed as an axle set and NOT individually. Use only pads which are permitted by the vehicle manufacturer, axle manufacturer and disc brake manufacturer. Failure to comply with this will invalidate any Knorr-Bremse warranty.*

6.2.1. Clean the brake pad bay area.

⚠ *Before inserting the brake pads, fully wind back the tappet and boot assemblies (13) by rotating the shear adapter (61) in an anti-clockwise direction (see Section 5.2).*

Note: *If in-pad wear indicators are necessary, this section should be followed in conjunction with section 6.3.*

6.2.2. Insert the brake pads (12) as follows:

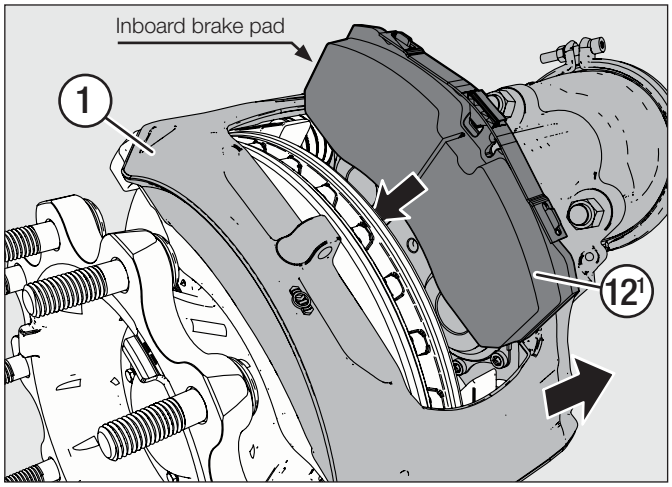
For **SK7** disc brakes the geometry of the brake pads (12) requires the following fitting procedure:

- Slide caliper (1) inboard and insert inner brake pad (12^1) (see Fig. 6.2.2a)
- Slide caliper (1) outboard and insert outer brake pad (12^2) (see Fig. 6.2.2b)

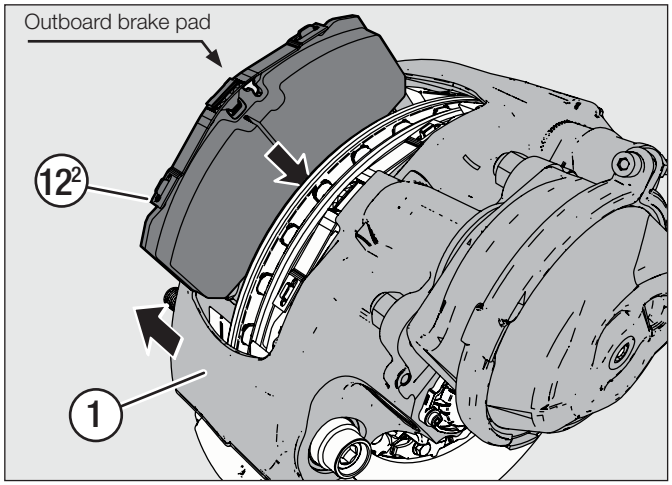
For **SN6** and **SN7** disc brakes there is no special fitting order for the brake pads (12), therefore the inboard or outboard pad can be fitted first.

6.2.3. Turn the shear adapter (61) clockwise until the pads come into contact with the disc. Do not overwind the adjuster. Then turn back the adjuster **three clicks** and check the running clearance (see Section 5.2) .

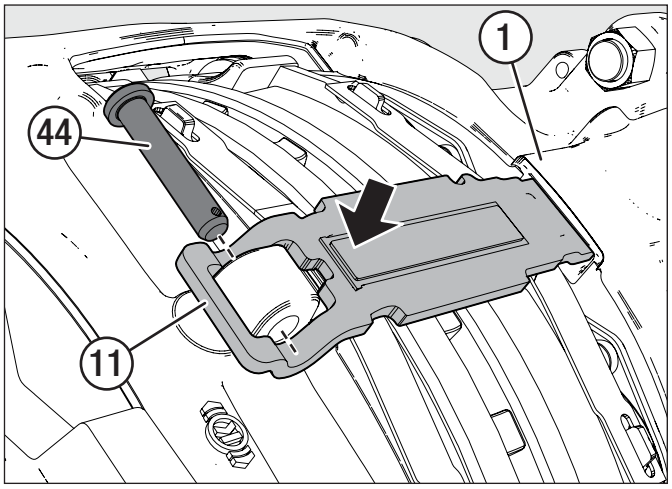
6.2.4. After fitting the pad retainer (11) into the groove of the caliper (1), it must be depressed to enable the insertion of the pad retainer pin (44) (only use new parts) (see Fig.).



6.2.2a - Insert inboard brake pad (SK7)



6.2.2b - Insert outboard brake pad (SK7)



6.2.4 - Fitting pad retainer and pin

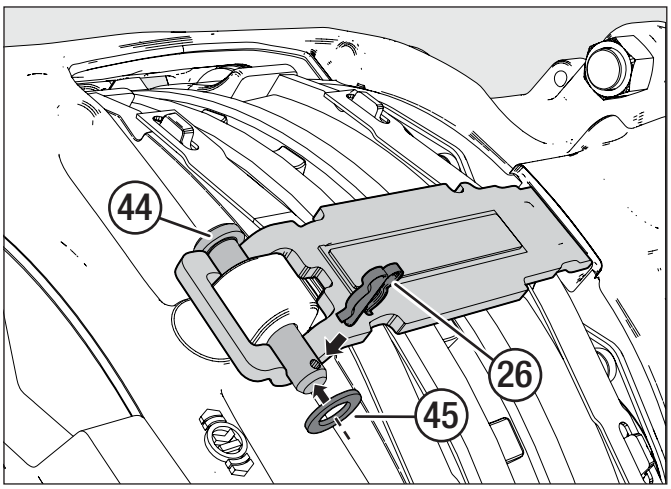
6.2.5. Fit new washer (45) and then new spring clip (26) to the pad retainer pin (44) (use only new parts).

⚠ *It is recommended that pad retainer pin (44) where possible, is installed pointing downwards.*

6.2.6. The adjuster cap (37) must then be replaced (use only a new cap) having lightly greased its contact surface with grease (available as Part No. II14525 or II32868) (see Fig.).

Note: *The tag of the adjuster cap (37) should be positioned as shown (see arrow). This ensures access is maintained for subsequent removal.*

If required, fit cable guides and pad wear indicators (see Section 6.3).



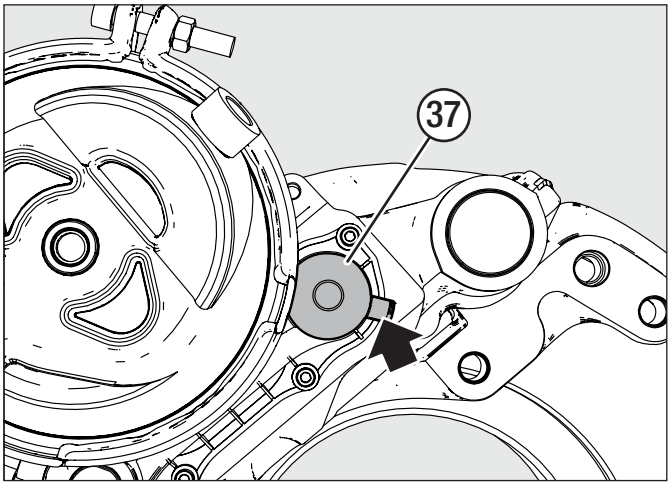
6.2.5 - Fit new washer and new spring clip

6.2.7. Re-fit wheel according to the vehicle manufacturer's recommendations.

After the brake pedal is depressed and released, the wheel hub should turn freely by hand.

⚠ *After any service work: Check the brake performance and the system behaviour on a roller dynamometer. Check function and effectiveness.*

Bear in mind that a lower performance can appear during the breaking-in phase of the brake pads and/or the brake disc.



6.2.6 - Fit new adjuster cap, note tab position

6.3 Fitting Pad Wear Indicators

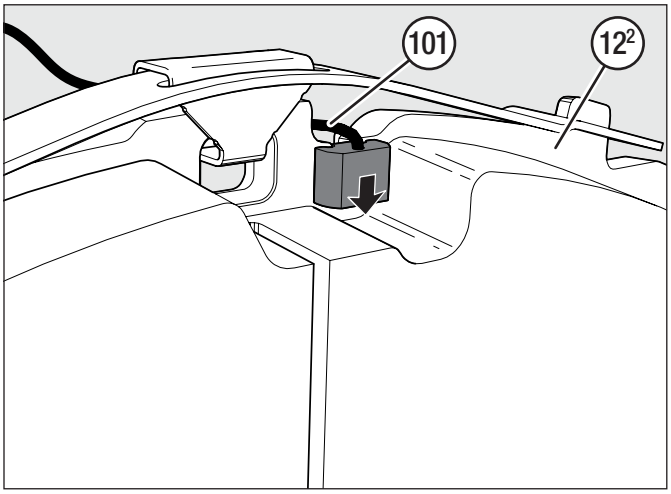
⚠ *Only use new pad wear indicators. The fitting of used pad wear indicators is not allowed.*

For pad removal see section 6.1.

The components of the wear indicator kits are shown in section 1.2.1.

Note: *The longer end of the cable fits onto the outboard pad (12^2), the short end onto the inboard pad (12^1).*

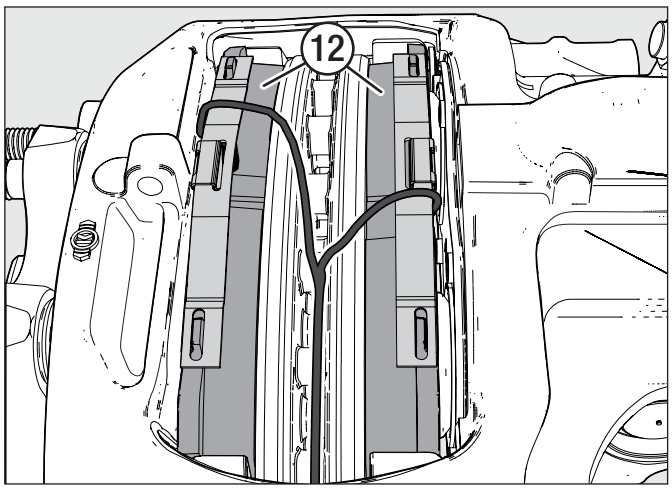
6.3.1. Align each sensor in the groove of a brake pad (12) and press down until it locks into place (see Fig.).



6.3.1 - Fitting pad wear indicators

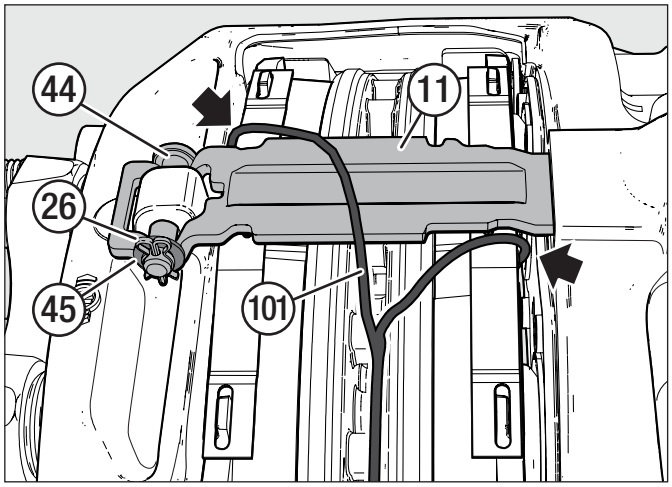
6.3.2. Insert the brake pads (12) with pre-assembled wear indicators into their respective brake pad bay area (see Fig.).

Note: *See also section 6.2.2.*



6.3.2 - Insert pre-assembled pads

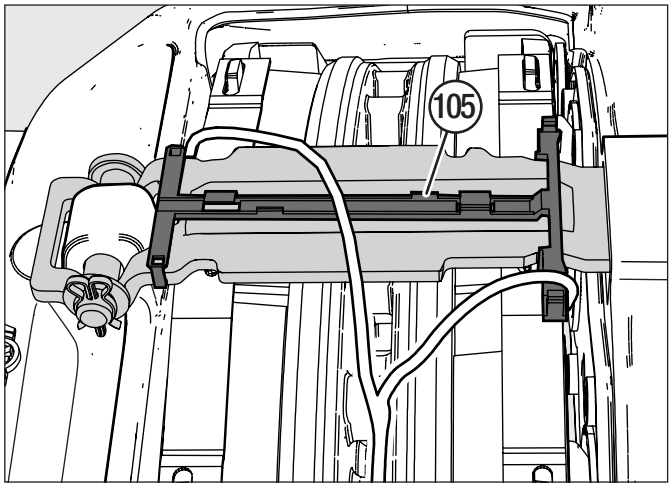
6.3.3. Fit pad retainer (11) with retainer pin (44), washer (45) and spring clip (26) (see Fig. and Section 6.2). Note the correct position of the cables (101) (see arrows).



6.3.3 - Fit pad retainer

Fitting of Cable Guide Variant (105)

6.3.4. Fit the cable guide variant (105) onto the pad retainer (11). When correctly positioned, and whilst applying light pressure, the cable guide (105) will lock easily into place (see Fig.).

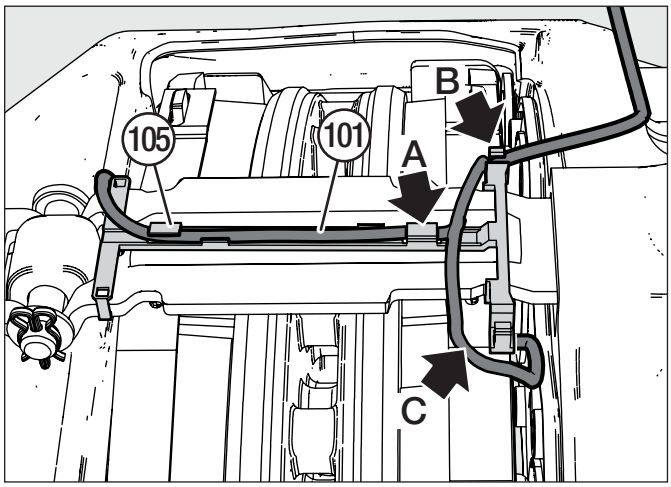


6.3.4 - Fitting cable guide

6.3.5. Carefully insert the cable (101) into the retainer tabs (arrows **A**) of the cable guide (105). Note that the shorter cable from the inboard pad is not fixed to any part of the cable guide (105) (arrow **C**).

Depending on the vehicle type, the supply line of the cable (101) is fixed into one of the outer retainer clips (arrow **B**).

Note: *The short cable (inboard side) remains loose (arrow **C**).*



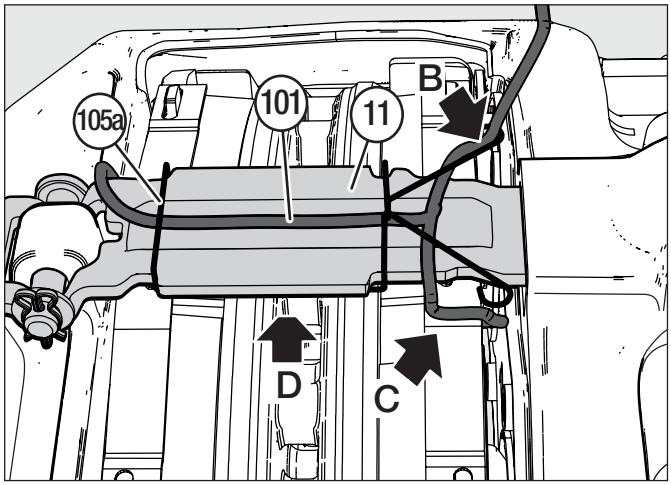
6.3.5 - Cable fixture position on cable guide (105)

Fitting of Cable Guide Variant (105a)

6.3.6. Lay the cable (101) centrally on the pad retainer (11). Position the cable guide (105a) at the side of the pad retainer (11) (arrow **D**) and with light pressure clip into place on the opposite side (see Fig.).

Depending on the vehicle type, the supply line of the cable (101) is fixed into one of the outer retainer clips (arrow **B**).

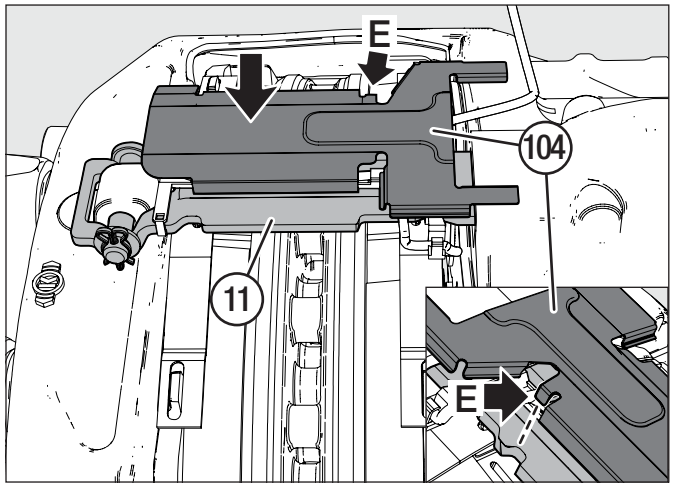
Note: *The short cable (inboard side) remains loose (arrow **C**).*



6.3.6 - Cable fixture position on cable guide (105a)

Fitting of Cable Protection Plate (104)

6.3.7. Position cable protection plate (104) on one side of the pad retainer (11), making sure the tab (arrow **E**) is located correctly, and apply pressure to snap into place (see main Fig. and detailed view).

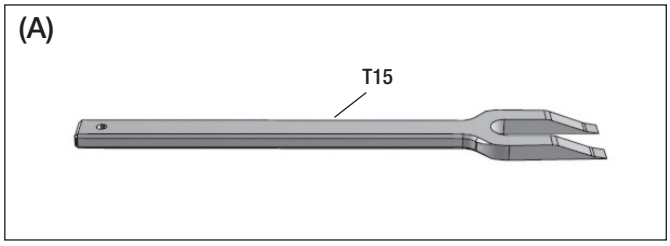


6.3.7 - Fitting cable protection plate

7 Tappet and Boot Assemblies (13) and Inner Seals (22) Replacement

For ease of reference, each component of a tool is referred to by an identification number e.g. (T28); a complete tool (containing one or more such components) has been given a letter code e.g. (**E**) - see section 2.1.

To remove the tappet and boot assemblies (13) use the wedge fork (**A**) (see Fig 7a).

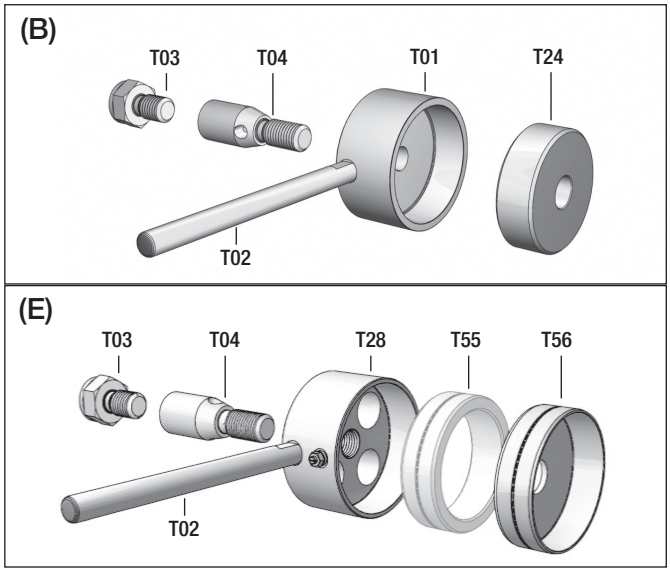


7a - Tool for replacing the tappet and boot assemblies

To fit the tappet and boot assemblies (13), use tool (**E**) (see Fig 7b).

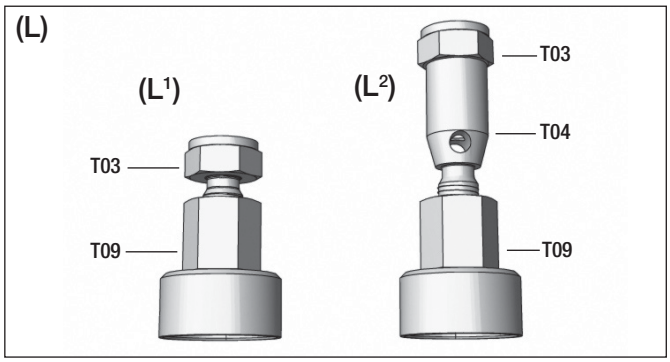
Note: *Older versions of the tool kit were supplied with tool (**B**), which in this case, can be used instead of (**E**). Refer to the service manual included in the old service kit.*

Tool component (T55) is necessary to service the brake types SL7 and SM7 (see also service manual Y081564).



7b - Tool for fitting the tappet and boot assemblies

To fit the inner seal (22), use tool (**L**) in configuration (**L**[1]) when the caliper is mounted on the vehicle or configuration (**L**[2]) when removed from the vehicle (see Fig 7c).



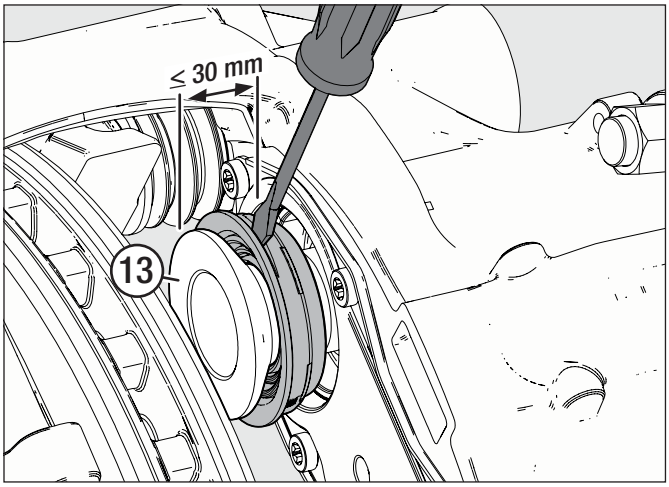
7c - Tool for fitting the inner seal

7.1 Removal of Tappet and Boot Assemblies (13)

Note: *The removal of the tappet and boot assemblies (13) can be done with the brake caliper fitted to, or removed from, the vehicle (see Section 8)*

With Caliper Fitted:

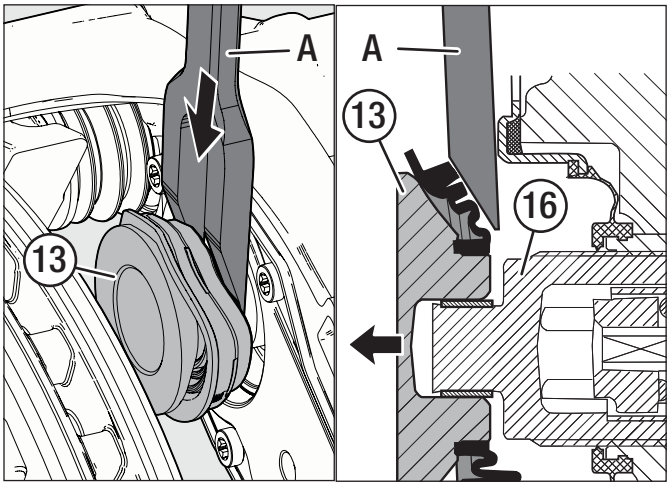
7.1.1. Wind-out the adjuster (23) using the shear adapter (61) until the boots are easily accessible (**max. 30 mm**) (see Section 5.4.2), and, with a suitable lever, carefully prise the boot away from the caliper (see Fig.).



7.1.1 - Wind-out the adjuster, prise out the inner boot.

7.1.2. Using tool (**A**), correctly positioned between the caliper and the boot, carefully drive it down with the aid of a hammer to release each tappet and boot assembly (13) from its threaded tube (16) (see Figs.).

7.1.3. Remove the old tappet bush (161) (see Fig.).

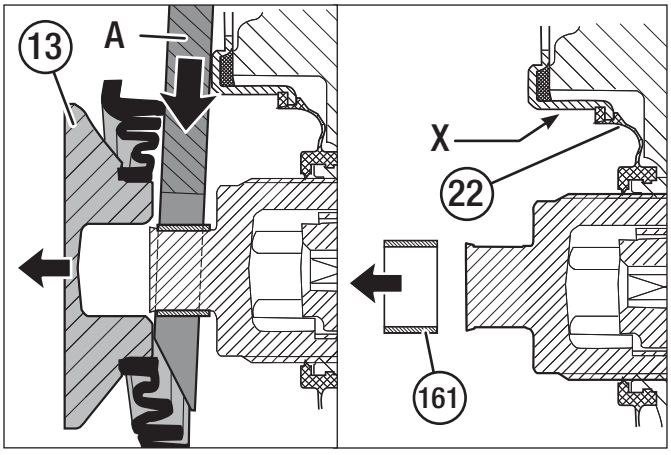


7.1.2a - Remove tappet and boot assembly using tool (**A**)

7.1.4. Check inner sealing face (arrow **X**) (see Fig.).

⚠ *This sealing face must not be damaged. It cannot be replaced. If it is damaged, the caliper must be replaced. (see Section 8).*

Note: *When replacing tappet and boot assemblies (13), the inner seals (22) must also be replaced (see Section 7.2).*



7.1.2b - Drive down wedge fork using hammer

7.1.3 - 7.1.4 - Remove old tappet bush, check sealing face

Inspection of Threaded Tube (16)

With caliper installed on vehicle:

7.1.5. Place a new brake pad (12) in the outboard position and wind-out the threaded tube (16), by turning the shear adapter (61), until it touches the brake disc. Check the threads when winding-out for corrosion and damage (see Fig.).

In case of water ingress or corrosion, the caliper must be replaced (see Section 8).

⚠ *Never turn adjuster (23) without shear adapter (61) being fitted. If the shear torque of the shear adapter is exceeded, then it is designed to fail. Try again with a new (unused) shear adapter. With a second failure of the shear adapter the caliper must be replaced since internal damage is present.*
Do not use an open-ended spanner on the shear adapter!

⚠ *The threaded tubes must **not** extend more than **30 mm**, otherwise synchronisation is lost and the caliper must be replaced.*

With caliper removed from vehicle:

7.1.6. If the caliper is not installed on the vehicle, place spacer **S** (length = **70 mm**) into the caliper (1) to avoid loss of thread engagement of the threaded tubes (16). Check the threads when winding-out for corrosion and damage (see Fig.).

In case of water ingress or corrosion, the caliper must be replaced (see Section 8).

7.2 Replacement of Inner Seals (22)

With caliper installed on vehicle:

7.2.1. Fully wind back the threaded tubes (16) by turning the shear adapter (61) (see Section 6.1.4).

7.2.2. Clean area of the inner seal (22) and then, using a suitable lever (**Y**), carefully remove the inner seal (22) (see Fig.).

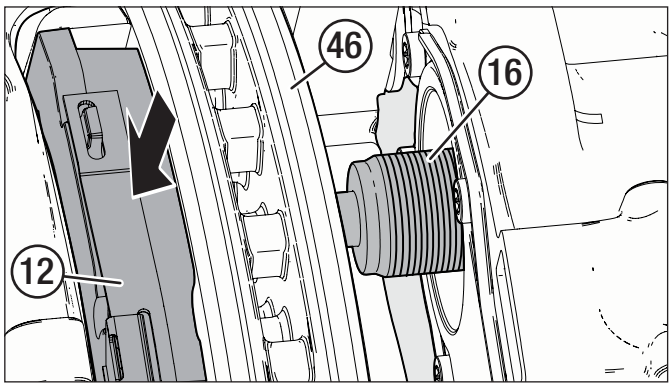
⚠ *The sealing surface (**X**) for the inner seal (22), must not be damaged else the caliper must be replaced.*

7.2.3. Clean sealing surface (**X**) (see Fig.).

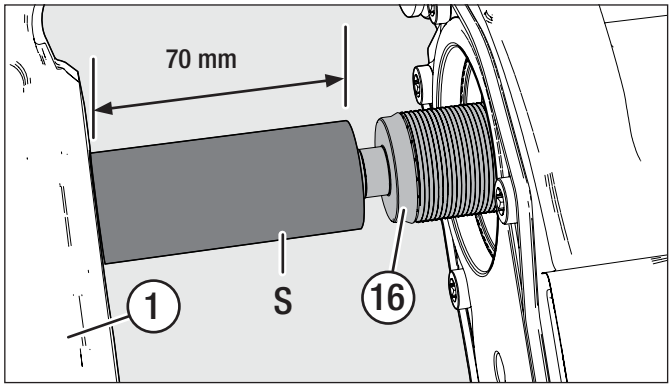
7.2.4. Wind-out the threaded tubes via the shear adapter (61) to a maximum of **30 mm** whilst at the same time inspecting them for corrosion or damage (see Section 7.1.5 -7.1.6)

7.2.5. Lubricate threads with white grease (Part No. II14525 or II32868) and then wind back the threaded tubes until they stop (see Fig.).

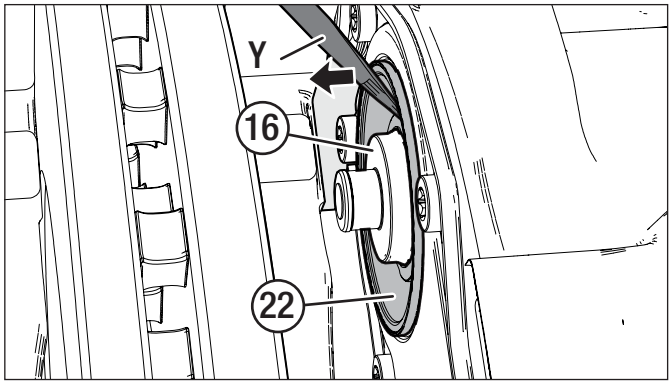
7.2.6. Fit new inner seals (22) onto the threaded tubes (16) and carefully push into position.



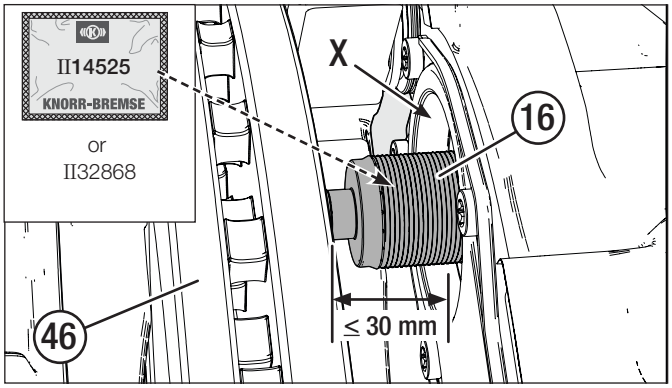
7.1.5 - Inspection of threaded tube (installed on vehicle) using new brake pad



7.1.6 - Inspection of threaded tube (removed from vehicle) using spacer



7.2.2 - Clean area and remove inner seal



7.2.3 - 7.2.5 - Wind out threads, inspect, grease threads and wind back

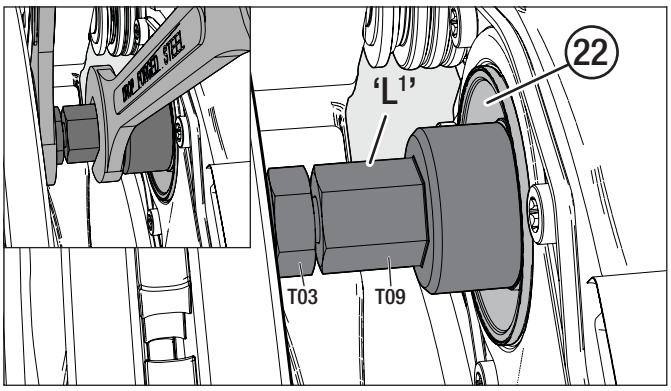
7.2.7. Guide the tool (**L¹**) over the spigot of the threaded tube (16) as shown, screw out (T03) until it touches the brake disc (see Fig.).

7.2.8. Fully press in the inner seal (22) by securing (T09) with a spanner 27 A/F and rotating (T03) against the brake disc using a second spanner until it stops (see Fig.).

7.2.9. Unscrew (T03) and remove complete tool (**L¹**).

7.2.10. Check the correct fitting of the inner seal (22) by winding out the threaded tubes (16) four or five threads via the shear adapter (61).

Note: *The inner seal (22) must not turn.*



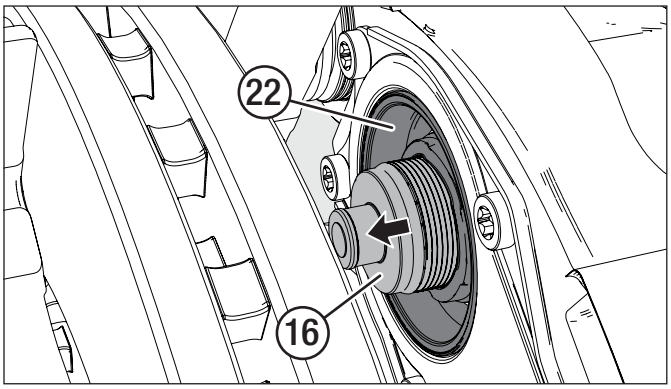
7.2.7 - 7.2.8 - Using press-in tool **L¹** to fully press in inner seal

With caliper removed from the vehicle: (not shown):

The fitting sequence of inner seal (22) is basically the same as when the caliper is installed on the axle (see previous section), but use the press-in tool (**L²**) with (T03+T04+T09) to press in inner seal (22) (see Section 7).

Check the correct fitting of the inner seal (22) by winding out the threaded tubes (16) four or five threads via the shear adapter (61).

Note: *The inner seal (22) must not turn.*

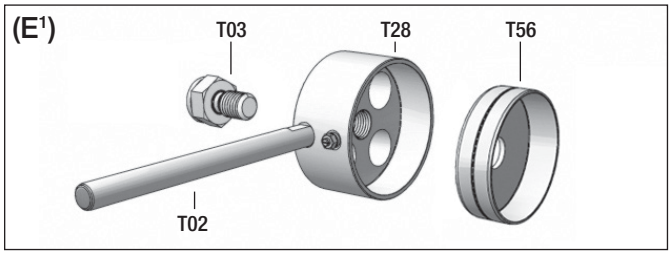


7.2.10 - Checking correct fitment of inner seal

7.3 Fitting of Tappet and Boot Assemblies (13)

⚠ *The Tappets are supplied with a special long-life lubricant within a protective cap.*

Before fitting, the protective cap must be removed and discarded in the appropriate manner. The lubricant must not be smudged or removed. Transfer of the lubricant to other parts should be avoided. Also adding additional lubrication from any other substance is not allowed.



7.3.1 - Press-in tool (**E¹**)

With caliper installed on the vehicle:

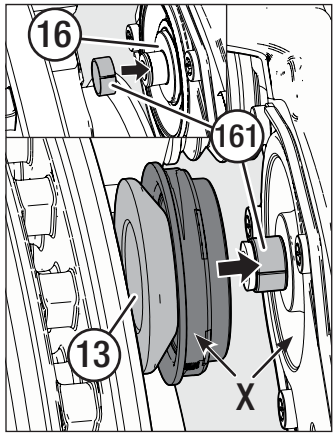
7.3.1. To fit the tappet and boot assemblies (13), use tool (**E¹**) (see Fig.).

7.3.2. Wind back fully the threaded tube (16) until it stops (see Section 6.1.4).

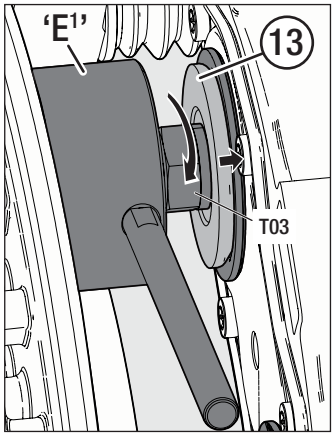
Note: *The sealing surface (**X**) for the boots in the caliper must be clean and free of lubrication.*

7.3.3. Fit new tappet bushes (161) onto the spigots of the threaded tubes (16), then follow with the tappet and boot assemblies (13) pushing them into position (see Fig.).

7.3.4. Position tool (**E¹**), note at this point (T56) is not required, so that (T28) touches the brake disc. Using a spanner, screw out (T03) to press tappet and boot assembly (13) into place.



7.3.3 - Fit new tappet bush / tappet with boot assembly to the spigot

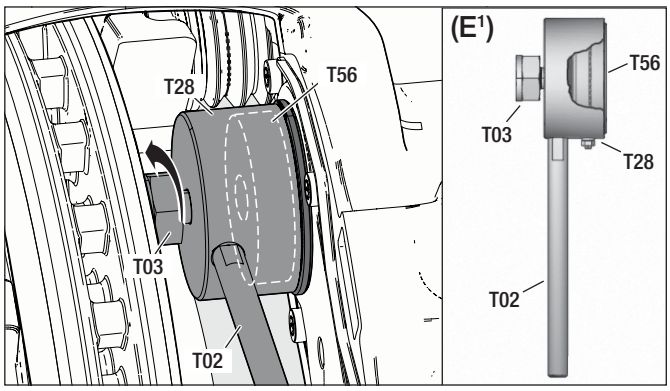


7.3.4 - Press in the tappet using tool (**E¹**) (without T56)

7.3.5. Release tool (**E**[1]) and then turn it over so that tool (T28) can make contact with the boot.

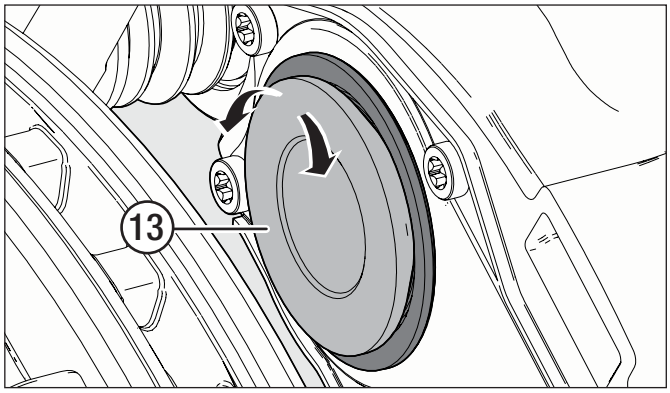
Note: *For the next procedure, place tool (T56) into tool (T28) with open side facing out (as shown in Fig. 7.3.1).*

7.3.6. Press-in the boot of the tappet (13) using tool (**E**[1]) by winding out (T03) against the brake disc (see Fig.).



7.3.6 - Press-in boot using tool (**E**[1]).

7.3.7. Check that the tappet (13) turns slightly in each direction (take care not to overstretch the tappet boot) (see Fig.).



7.3.7 - Tappet should turn slightly in each direction

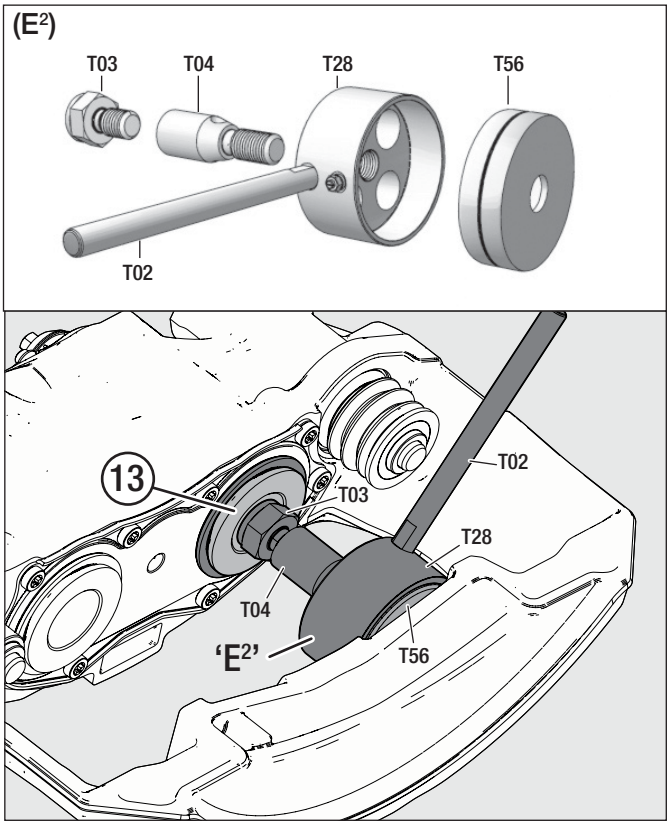
With caliper removed from the vehicle:

The fitting of each tappet and boot assembly (13) requires tool (**E**) (see Section 7).

Follow steps 7.3.2 and 7.3.3 from previous section then, for each tappet and boot assembly:

7.3.8. Position tool (**E**[2]) as shown. Note that tool (T56) must be inserted into tool (T28) with closed side facing out. Using a spanner screw out (T03) to press tappet and boot assembly (13) into place.

Note: *Tool (T56) is required to maximise grip on the caliper.*

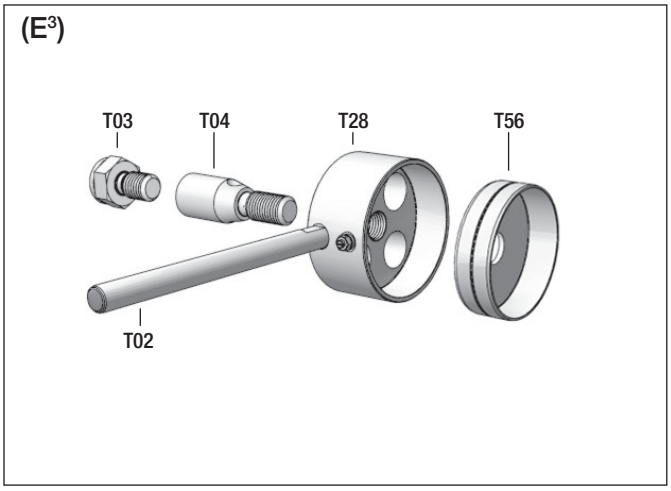


7.3.8 - Press in tappet using tool (**E**[2]) (with T56)

7.3.9. Release tool (**E²**) and then turn it over so that (T03) can make contact with the caliper.

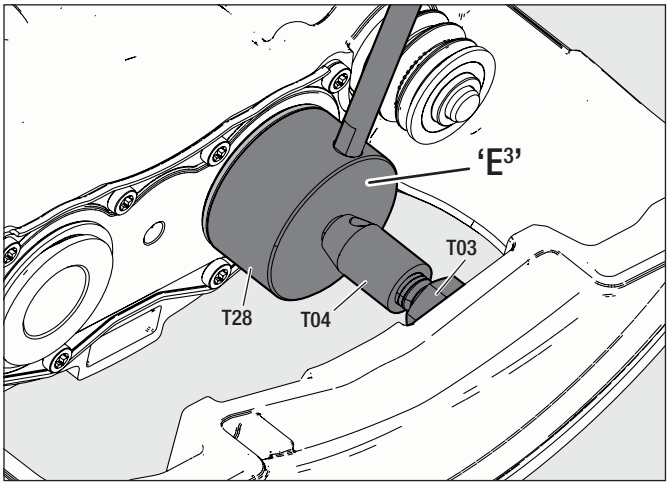
To centralise (T28) with tappet (13), the threaded tube must be wound clockwise two turns by using the shear adapter (61).

7.3.10. To press in the boot of the tappet (13) tool (**E³**) is required. Note that (T56) must be inserted into (T28) with open end facing outwards. (see Fig.).



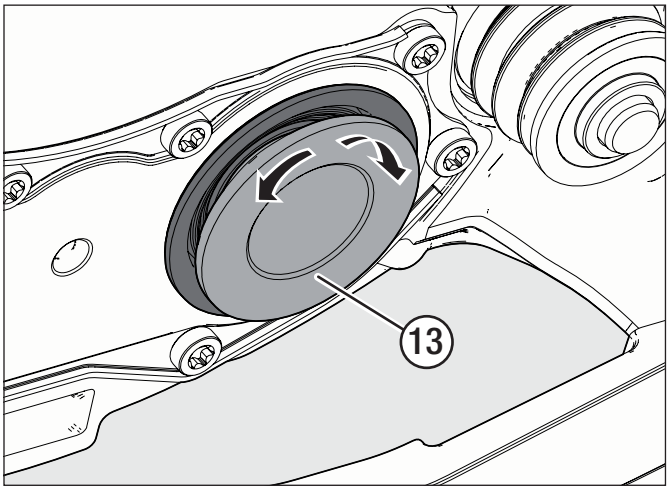
7.3.10 - Tool (**E³**)

7.3.11. Position tool (**E³**) so that (T03) screws out against the caliper as shown. Using a spanner, screw-out (T03) to press-in the boot (see Fig.).



7.3.11 - Press-in the boot of the tappet using tool (**E³**)

7.3.12. Release and remove tool (**E³**), check that the tappet (13) turns slightly in each direction (take care not to overstretch the tappet boot)) (see Fig.).

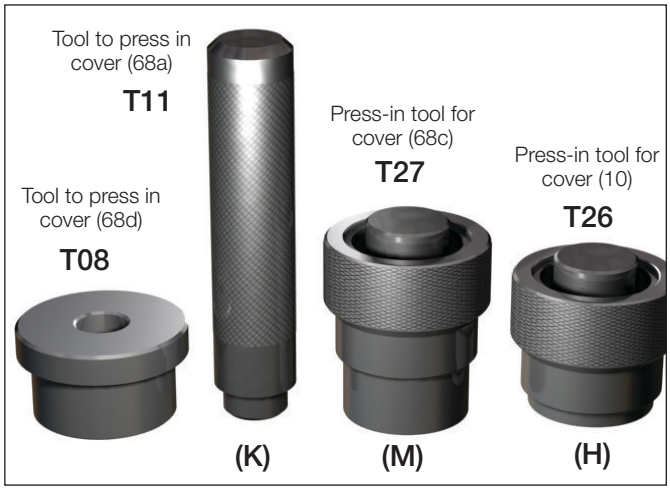


7.3.12 - Tappet should turn slightly in each direction

8 Caliper Replacement

For ease of reference, each component of a tool is referred to by an identification number e.g. (T28); a complete tool (containing one or more such components) has been given a letter code e.g. (**E**) - see section 2.1.

8.0. To replace the cover (10) use the press-in tool (**H**), for cover (68a) use press-in tool (**T11**), for cover (68c) use press-in tool (**M**) and for cover (68d) tool (T08) is required (see Fig.).



8.0 - Press-in tools for cap and covers

8.1 Removal of Caliper from Carrier

8.1.1. Remove the brake pads (12) (see Section 6.1).

8.1.2. Remove brake actuator (see Section 12). If fitted, remove wear indicator cable and potentiometer.

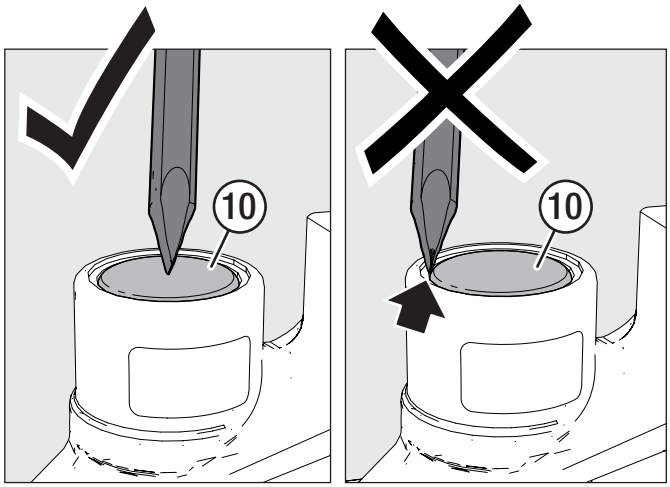
⚠ *Do not touch electrical contact points - possible static discharge!*

Note: *It may be necessary for reasons of accessibility to remove the caliper and carrier from the axle (refer to vehicle manufacturer's recommendations) or remove only the caliper.*

Removal of Cover (10)

8.1.3. Use a suitable tool (e.g a chisel) to penetrate the cover (10) creating a hole to allow easy removal (see Fig.).

Note: *during penetration the cover (10) may move approximately 10 mm inwards*

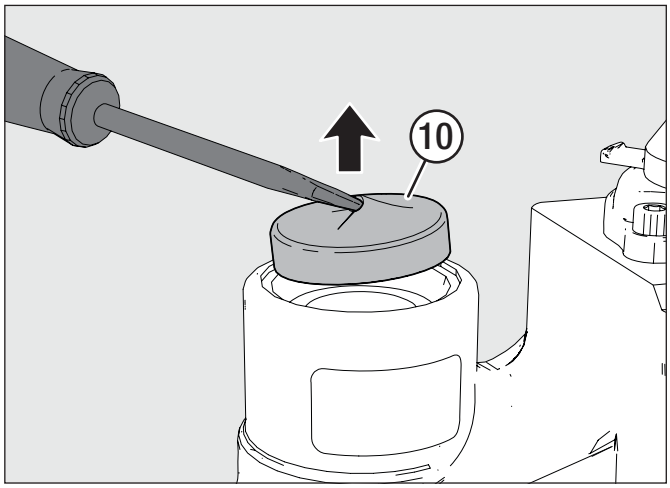


8.1.3 - Penetrate cover in the centre using suitable tool

⚠ *Cover (10) should be penetrated in the middle. Do not drive the tool between caliper bore and cover (10) since caliper bore may be damaged.*

8.1.4. Remove cover (10) using a suitable tool (e.g a screwdriver) by inserting it into the created hole and levering it out.

Check the inside area of the bearing for dirt or corrosion. If necessary replace with a new guide and seal kit. In case of damage or excessive corrosion, the caliper must be replaced.



8.1.4 - Remove cover using suitable tool

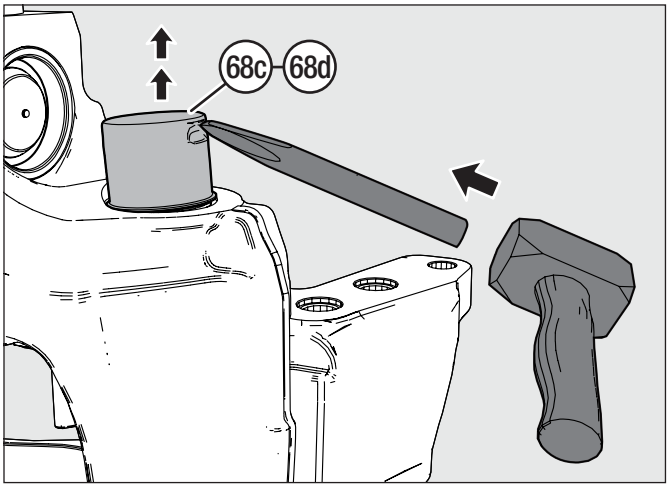
Removal of Cover (68c) or (68d)

8.1.4. Due to the protrusion of covers (68c) or (68d), the removal procedure is from the side and in an upward direction as shown (see Fig.).

Note: *Do not hit the covers* (68c) or (68d) in direction of the caliper as damage may occur to the caliper.

Check the inside area of the bearing and the cover for dirt or corrosion. If necessary replace with a new guide and seal kit. In case of damage or excessive corrosion, the caliper must be replaced.

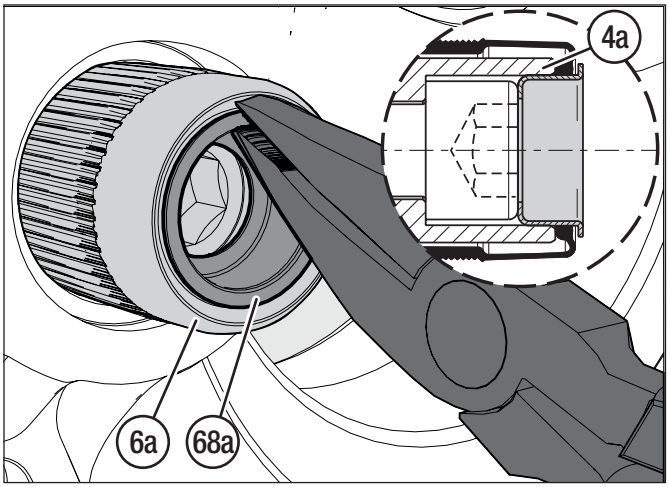
⚠ *The rubber bush (6d) will release itself from the carrier bore with cover (68d).*



8.1.4 - Removal of cover (68c or 68d)

Removal of Cap (68a)

8.1.5. Carefully remove cap (68a) from the guide pin (4a) using a suitable tool, avoid damaging the cap.



8.1.5 - Removal of cap (68a)

Removal of Caliper

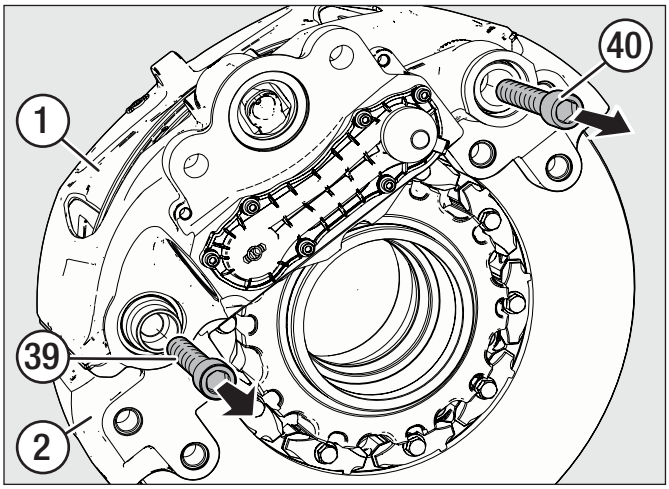
⚠ *Before removing the caliper bolts (39 and 40) ensure that the caliper (1) cannot move or fall when the caliper bolts are removed causing damage or injury.*

8.1.6. Screw out the caliper bolts (39) and (40) (see Fig.).

⚠ *Never hold the caliper with your fingers between caliper and carrier - there is a risk of injury! Do not fasten any lifting device to the pad retainer (11), since this could be damaged.*

⚠ *The opening or dismantling of the caliper is not authorised. Use only genuine Knorr-Bremse replacement calipers.*

8.1.6. Remove caliper (1) from carrier (2).



8.1.6 - Remove caliper bolts

8.2 Fitting Caliper to Carrier - (Carrier assembled on vehicle)

8.2.1. The correct choice of caliper must be ensured by checking the part number on the identification label (arrow **X**).

Remove plastic cover or the adhesive tape (arrow **Y**) in the area of the actuator attachment from the replacement caliper (see Fig. 8.2.1a).

Alternatively, if the replacement caliper has a breakthrough diaphragm, it should be left in place (see Fig. 8.2.1b).

The caliper guide sleeves should be overhauled with the respective guide and seal kit (see Section 9 and 10), or the caliper replaced with the compatible rationalised caliper.

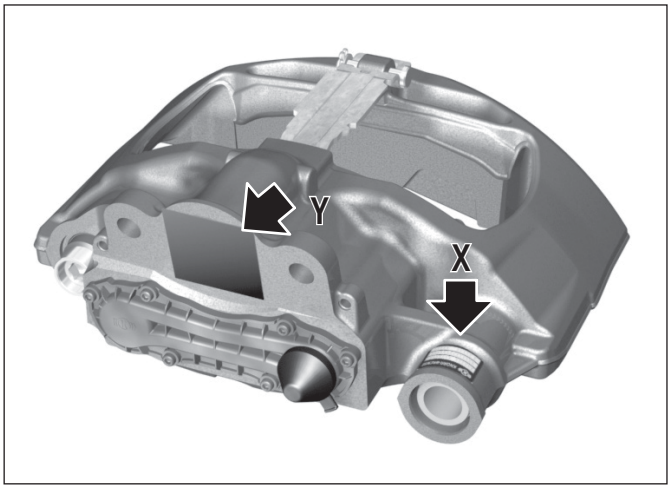
Note: *The replacement caliper includes seals and guide pins as well as bolts and bushes for fitting the caliper to the carrier. Brake pads and wear sensors are not included.*

If the replacement caliper is equipped with a potentiometer, then the connection must be made using the appropriate mating plug - refer to vehicle manufacturer's recommendations.

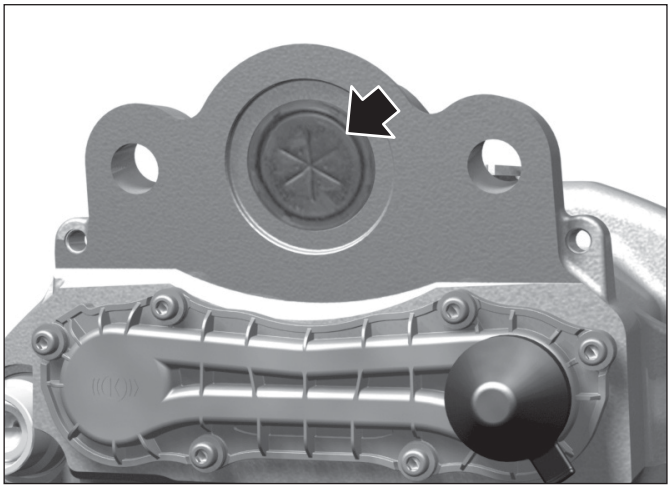
⚠ *Never hold the caliper with your fingers between caliper and carrier - there is a risk of injury! Do not fasten any lifting device to the pad retainer (11), since this could be damaged.*

⚠ *The guide pins (4) and (5) as well as the caliper bolts (39) and (40) are highly stressed items. They must be replaced whenever the caliper (1) is removed from the carrier (2).*

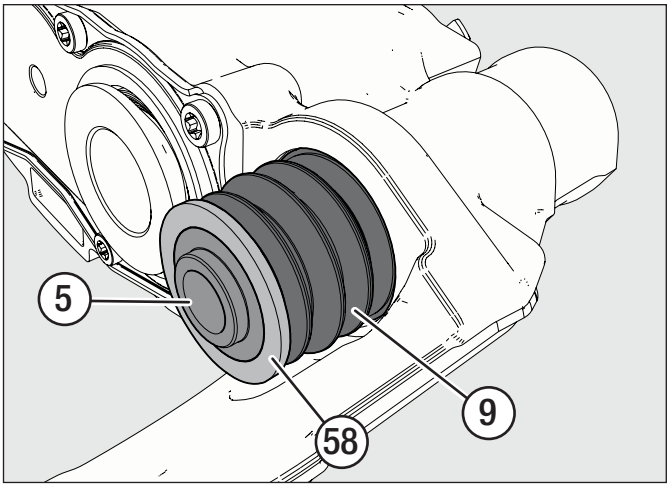
8.2.2. Check that the inner boot (9 and 9c or 9d according to bearing variant) and the ring (58) sit correctly on the guide pin (5) (see Fig.).



8.2.1a - Note identification label, remove adhesive tape



8.2.1b - Breakthrough diaphragm to be left in place



8.2.2 - Check that inner boot and ring sit correctly

8.2.3. Place caliper (1) onto the carrier (2) and insert the caliper bolts (39) and (40). Tighten bolts to 180 Nm, then tighten by a further 90° (**use only new parts**) (see Fig.).

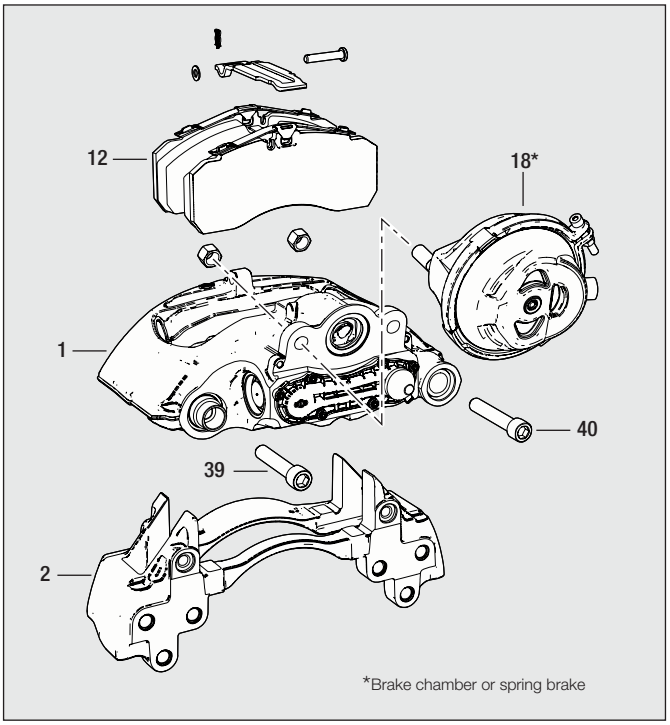
⚠ *Screw threads and tapped holes must be clean and dry (free of lubrication and residuals of pre-applied adhesive).*

8.2.4. Check that the caliper slides easily on the guide pins. (see Section 5.3)

8.2.5. Fit brake pads (12) (see Fig. and Section 6.2).

8.2.6. Check adjuster function (see Section 5.2).

8.2.7. Fit brake actuator (18) (see Fig. and Section 12.2 or 12.4).



8.2.3 - 8.2.7 - Fit caliper onto carrier, tighten caliper bolts , fit brake pads, fit brake actuator

Fitting of Cover Variants

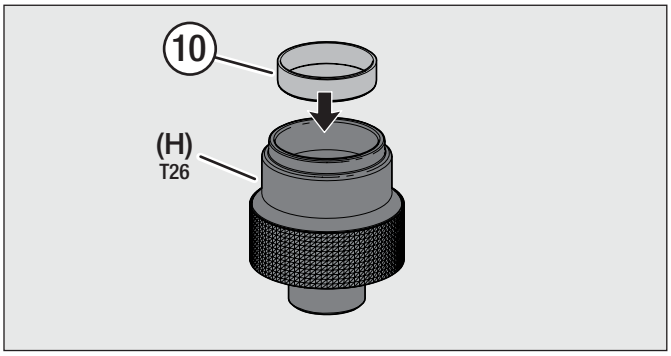
With Caliper (1) and Carrier (2) Assembled on the Vehicle:

⚠ *Fitting of covers can only be done after the caliper has been fully bolted to the carrier (see Section 8.2).*

Cover Variant (10) - Long Bearing Side

Caliper bores and cover must be clean and free from lubrication.

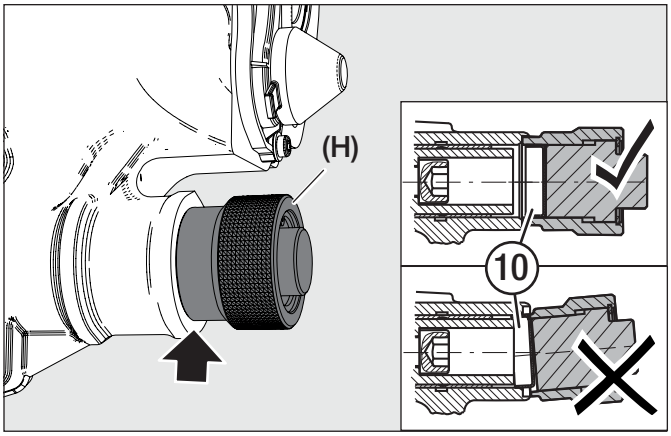
8.2.8. Clean the new cover (10) and the interior of the press-in tool (**H**) and insert the cover (10) into tool (**H**) as shown (see Fig.).



8.2.8 - Insert cover into tool (**H**)

8.2.9. Check the plane surface of caliper bore is clean and not damaged (see arrow). Position the press-in tool (**H**) including cover (10) squarely and check it sits correctly as shown (see Fig.).

Note: *Do not tilt the tool when assembling the cover (10)!*

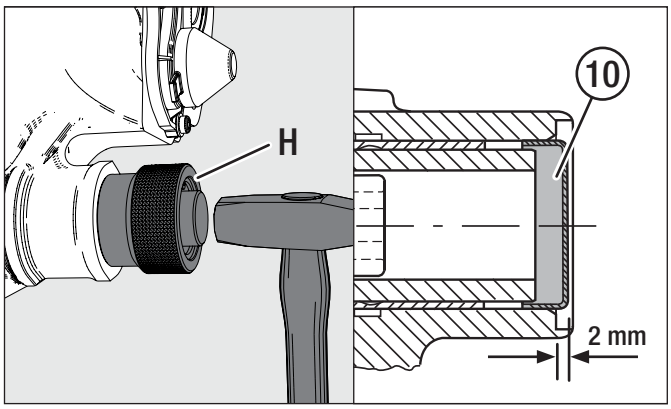


8.2.9 - Press-in tool (**H**) with cover in position on the plane surface of the caliper

⚠ *The inner boot (9) must be in a compressed condition otherwise the caliper´s freedom of movement will be limited.*

8.2.10. Press the mandrel of the press-in tool (**H**) firstly by hand until it stops, then, using a hammer on the mandrel, insert the cover to the end stop (see Fig.).

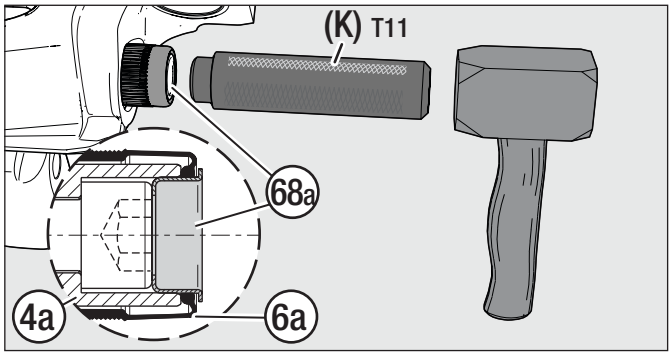
Note: *After fitting the new cover (10), ensure that it protrudes **2 mm** from the plane surface of the caliper (see Fig.).*



8.2.10 - Fitting cover to stop, final position protruding **2 mm**

Cap (68a) - Short Bearing Side

8.2.11. Fit the Cap (68a) using tool (**K**) (Z003934) and a Hammer. Force the Cap into the Guide Pin (4a) until firmly seated. The seal is achieved by the compression of the lip of the Rubber Bush (6a) between th Guide Pin (4a) and Cap (68a) (siehe Abb).

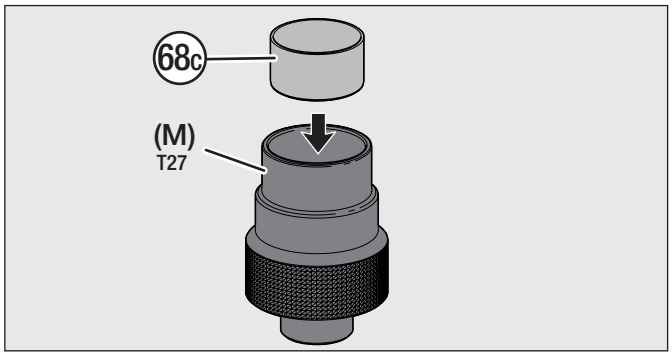


8.2.11 - Insert Cap into Guide Pin using tool (**K**)

Cover Variant (68c) - Short Bearing Side

Caliper bores and cover must be clean and free from lubrication.

8.2.12. Clean the new cover (68c) and the interior of the press-in tool (**M**) and insert the cover as shown (see Fig.).

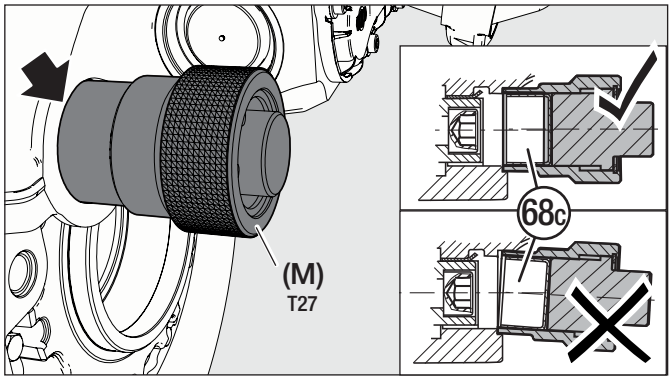


8.2.12 - Insert cover into tool (**M**)

8.2.13. Check the plane surface of caliper bore is clean and not damaged (see arrow). Position the press-in tool (**M**) including cover (68c) squarely and check it sits correctly as shown (see Fig.).

Note: *Do not tilt the tool when assembling the cover (68c)!*

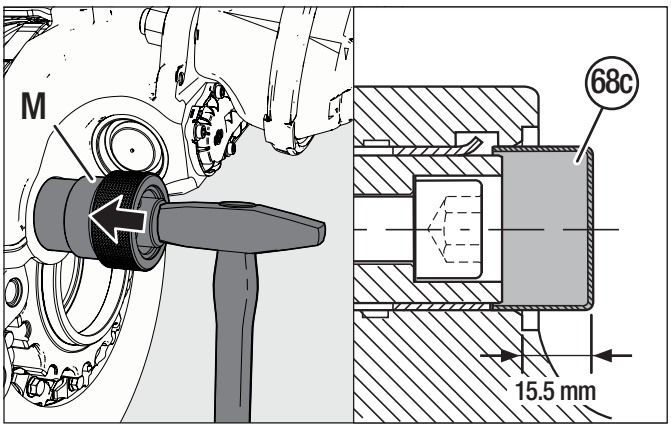
⚠ *The inner boot (9) must be in a compressed condition otherwise the caliper´s freedom of movement will be limited.*



8.2.13 - Press-in tool (**M**) with cover in position on the plane surface of the caliper

8.2.14. Press the mandrel of the press-in tool (**M**) firstly by hand until it stops, then, using a hammer on the mandrel, insert the cover to the end stop (see Fig.).

Note: *After fitting the new cover (68c), ensure that it protrudes* ***15.5 mm*** *from the plane surface of the caliper (see Fig.).*

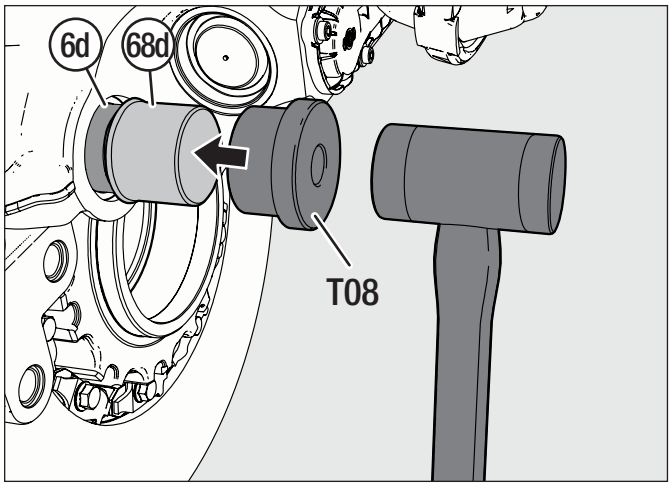


8.2.14 - Fit cover to stop, cover should protrude **15.5 mm**

Cover Variant (68d) - Short Bearing Side

8.2.15. Push cover (68d) over rubber bush (6d) by hand. Place tool (T08) onto cover (68d) and using a soft faced hammer fit cover (68d) to the end stop (see Fig.).

Note: *Use a soft faced hammer to avoid damage to tool (T08).*



8.2.15 - Fitting cover (68d)

Fitting of Cover Variants with Caliper (1) and Carrier (2) removed from the vehicle:

8.2.16. Check caliper slides freely along the whole length of the guide pin arrangement (see Section 5.3).

8.2.17. Fix the carrier securely as shown i.e. bench vice, and push the caliper down as much as possible against the carrier to ensure the inner boots (9) are fully compressed (see Fig).

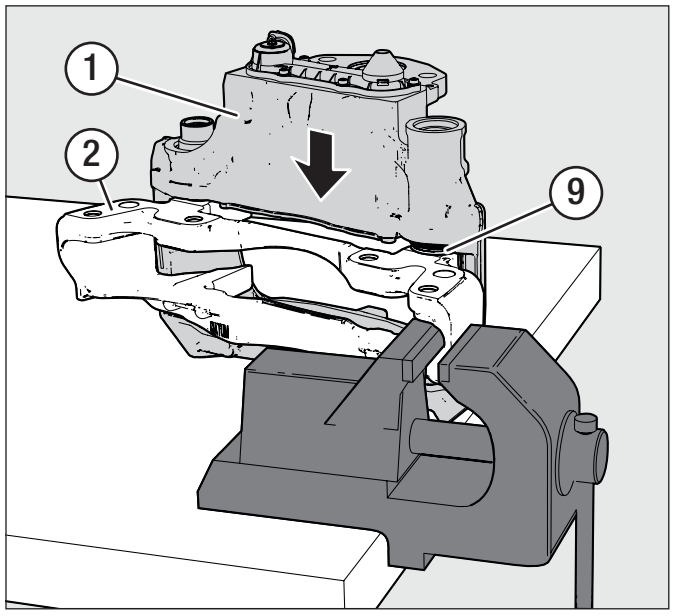
⚠ *The inner boots (9) must be in a compressed state otherwise the caliper´s freedom of movement will be limited.*

8.2.18. Assembly of covers (10), (68a), (68c) or (68d) can now proceed as previously described (see Section 8.2.8 - 8.2.14).

8.2.19. Fit brake pads (see Section 6.2).

8.2.20. Check adjuster (see Section 5.2).

8.2.21. Fit brake actuator (18) (see Section 12.2 or 12.4).



8.2.17 - Fix carrier, push caliper (1) against carrier (2)

9 Inner Boot (9) Replacement

For ease of reference, each component of a tool is referred to by an identification number e.g. (T28); a complete tool (containing one or more such components) has been given a letter code e.g. (**E**) - see section 2.1.

9.1. To fit the inner boot (9) use the pull-in tool (**C**) containing (T08). For the black coloured inner boot (9d), situated on the short bearing side, use (**T06**) instead of (**T08**) (see table 2.1).

9.2. Remove caliper (see Fig. and Section 8.1).

9.3. Remove ring (58) (see Fig.).

9.4. Pull out guide pin (5) (see Fig.).

9.5. Push out inner boot (9) with screwdriver or similar (see Fig.).

Note: *For caliper variants having an inner boot (9) on both bearing sides:*

- Remove ring (58) and (58c or 58d) (see Fig.).
- Remove guide pin (5) and guide pin (4c or 4d) (see Fig.).
- Ease out inner boot (9) and inner boot (9c or 9d) using a suitable tool e.g. screwdriver.

Note: *The following shows only the process for the long bearing side, but the assembly of the inner boot (9) is the same principle whether for the short or long bearing side.*

9.6. The contact surface of the boot (9) on the guide pin (5) and the caliper (1) must be clean and free of lubrication.

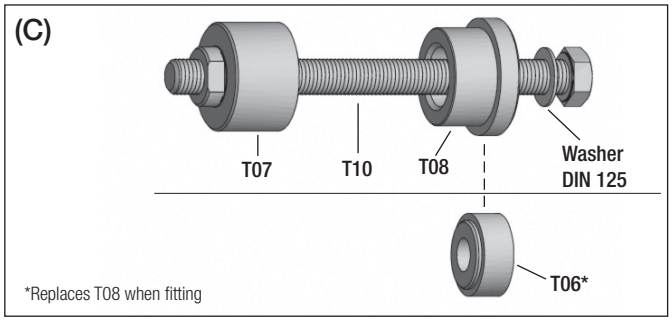
9.7. Check the sealing face of inner boot (9) for damage or corrosion (see Fig. arrow **A**).

Check brass bush (7) and, if installed, rubber bush (6), for corrosion, dirt or damage and replace as necessary (see Section 10.1 or 10.2)

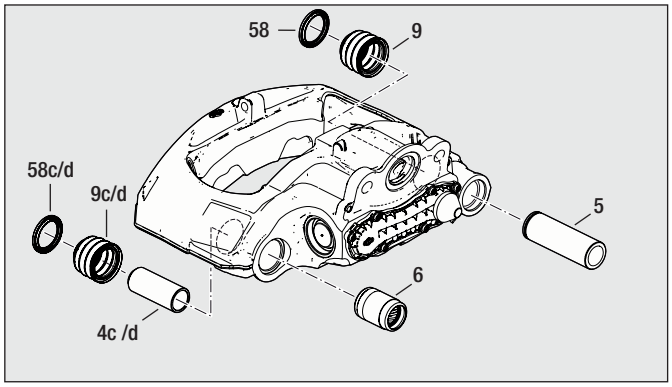
9.8. Fit new inner boot (9) into the sleeve (T07) of tool (**C**). Make sure the rubber folds of the boot sit inside the tool (See Fig. arrow **B**).

9.9. Position sleeve (T07) of tool (**C**) into the caliper bearing bore. Then attach the assembled sleeve (T07) (with inner boot (9)) pulling-in firstly by hand by turning tool (T10) (see Fig.).

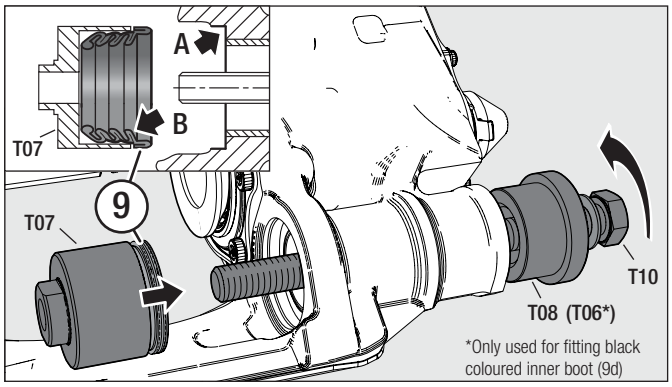
9.10. Then, pull-in with a maximum torque of **8 Nm** (see Fig.).



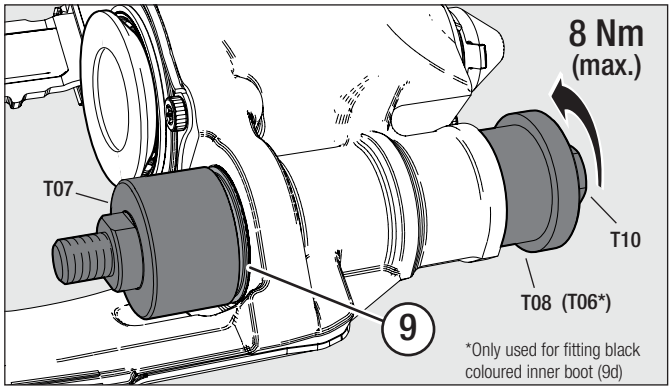
9.1 - Pull-in tool (**C**)



9.2 - 9.5 - Remove parts as described



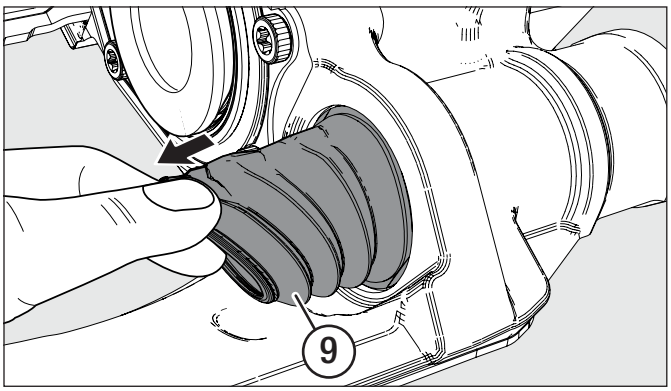
9.7 - 9.9 - Fit new inner boot with tool (**C**) into the caliper bore, pull-in by hand



9.10 - Pull-in with a maximum torque of **8 Nm**

9
Inner Boot (9) Replacement

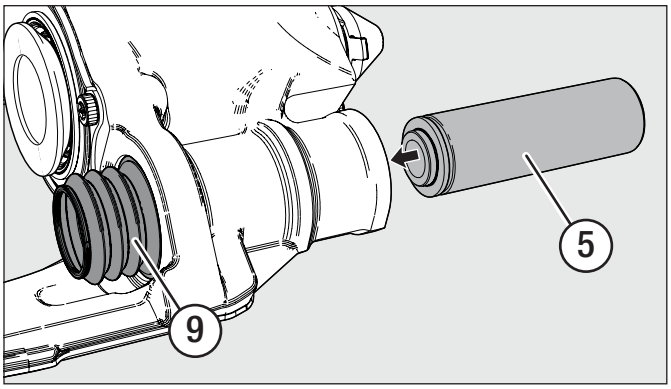
9.11. Check correct fitment of inner boot (9) by carrying out a pulling test (see Fig.).



9.11 - Carry out pulling test on inner boot

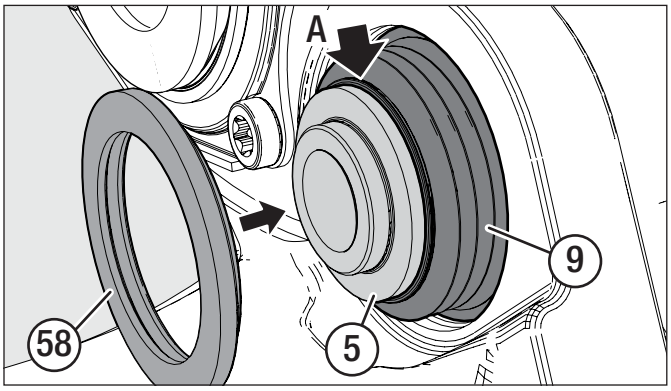
9.12. Grease brass bush (7) and, if installed, guide sleeve (6c) or rubber bush (6d), with white grease (Part No. II14525 or II32868).

9.13. Fit guide pin (5) and if necessary guide pin (4) (see Fig.).



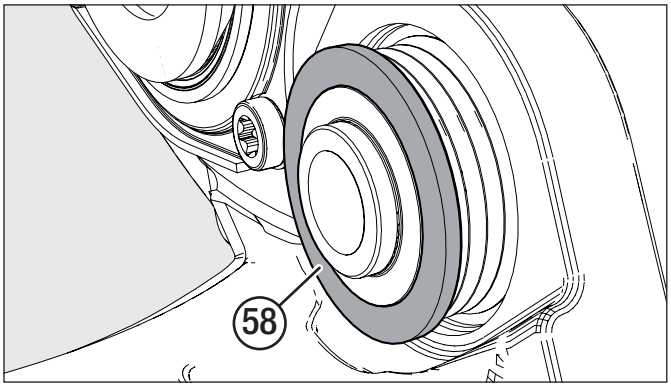
9.13 - Fit guide pin

9.14. The lip in the end of the inner boot (9) must engage in the groove of the guide pin (5) and, if installed, in the groove of guide pin (4) (see Fig. arrow **A**).



9.14 - Lip of inner boot engages in groove on guide pin (arrow **A**)

9.15. Push on the ring (58) to secure engagement of boot (9) in the groove of guide pin (5) or, if installed, in the groove of the guide pin (4) (see Fig.).



9.15 - Push on ring (58) to secure boot in groove of guide pin

9.16. Fit brake caliper to carrier (see Section 8.2).

10 Guide Pin Bush/Bearing Variants Replacement

For ease of reference, each component of a tool is referred to by an identification number e.g. (T28); a complete tool (containing one or more such components) has been given a letter code e.g. (**E**) - see section 2.1.

Remove caliper (1) (see Section 8.1).

10.1 Brass Bush (7) Replacement

In order to remove, fit and groove the brass bush (7) use the pull-out/pull-in and grooving tool (**D**).

10.1.1. Remove guide pin (5) and inner boot (9) (see Section 9). Clean surfaces (see arrows **A** and **B**) and clean brass bush (7) (see Fig.).

Removal of Brass Bush (7)

The use of impact screwdrivers / impact wrenches in conjunction with Knorr-Bremse service tools for air disc brakes is not permitted. The service tools are not designed for such use.

⚠ *Risk of injury. Knorr-Bremse accepts no liability for damage or injury resulting from negligence, any damage to service tools resulting from such actions will void all warranty.*

10.1.2. Place tool (**D**) in position as shown and ensure that (T14) is guided in brass bush (7). Pull out brass bush via spindle (T13) (see Fig.).

Note: *Make sure that (T14) sits in the brass bush (7).Tool (T12) must be placed square on the surface (see arrow **A**). Do not tilt the tool when removing!*

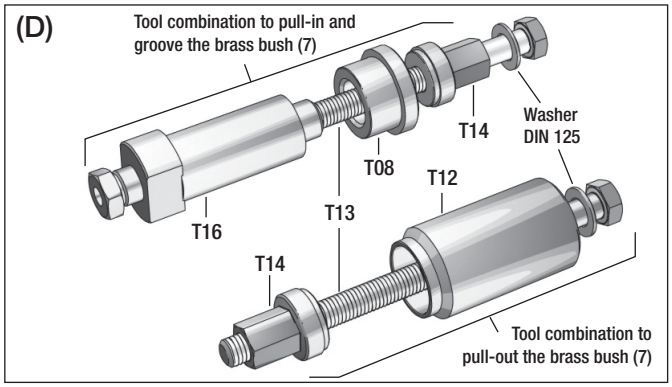
Fitting of Brass Bush (7)

10.1.3. Prepare tool (**D**) by firstly screwing (T14) onto the spindle (T13) until it stops. Place (T08) onto (T13). Place new brass bush (7) onto (T16) and insert into the caliper bore as shown (see Fig.).

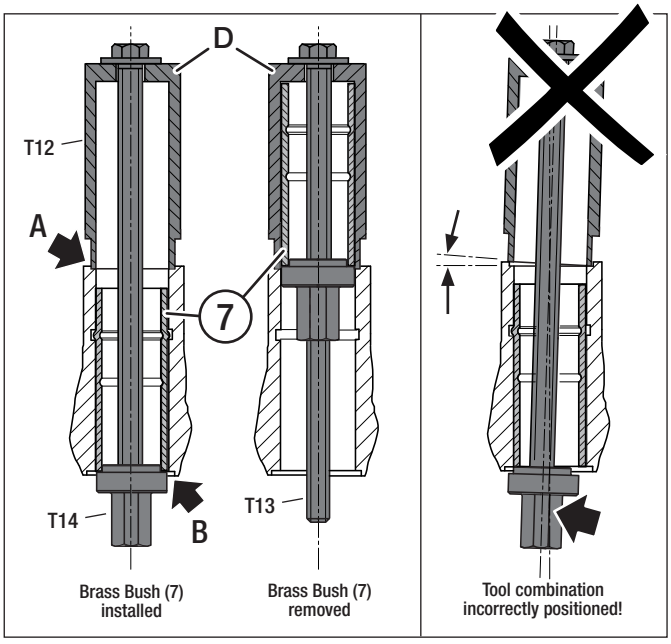
10.1.4. Position tool (**D**) from the opposite end and loosely screw into (T16) (see Fig.).

10.1.5. Screw (T13) into (T16) by hand until it stops. Check the free movement of (T16); (T08) must lie square on the surface (arrow **A**) (see Fig.).

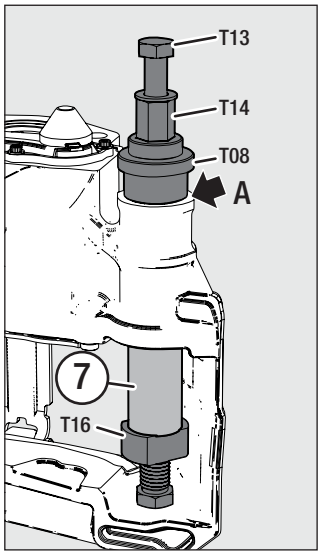
10.1.6. Pull-in brass bush (7) by turning (T14) until it stops (see Fig.).



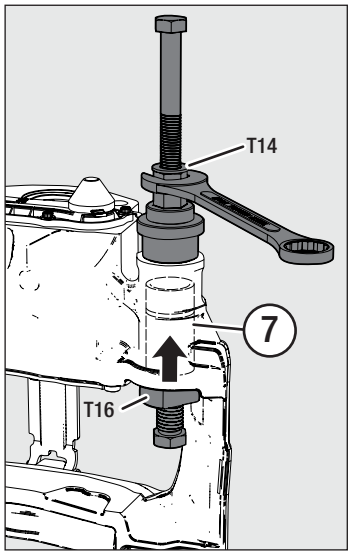
10 - Tool combination (**D**)



10.1.1 - 10.1.2 - Removal of brass bush using tool combination (**D**)



10.1.3 - 10.1.5 Positioning of tool (**D**) with new brass bush



10.1.6 - Pull-in brass bush by turning (T14)

10.1.7. To prevent longitudinal displacement of brass bush (7) it must be “grooved” (see arrow **A**).

10.1.8. The hexagon bolt (arrow **B**) of tool (T16) must be screwed in up to its stop. This process causes deformation within the brass bush.

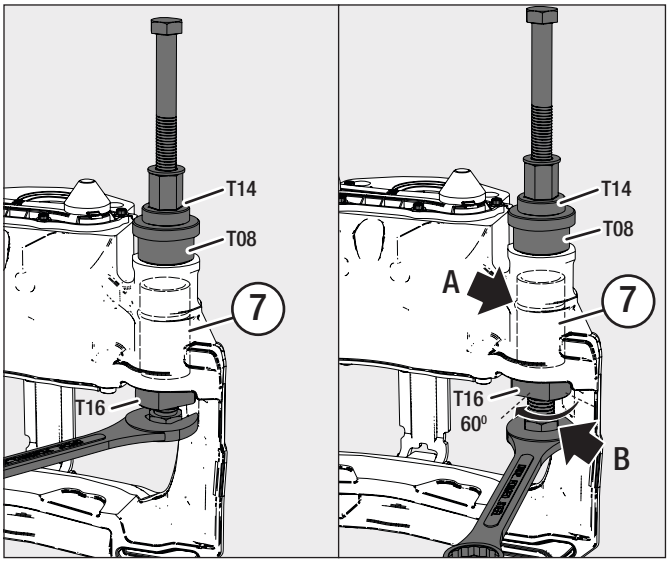
10.1.9. Wind back the hexagon bolt (arrow **B**) of tool (T16) approximately **20 mm**.

10.1.10. Slacken brass nut (T14) and rotate tool (T16) approximately 60°. Re-tighten brass nut (T14).

10.1.11. Repeat steps 10.1.8 and 10.1.9.

10.1.12. Remove tool (**D**).

10.1.13 Check contact area of brass bush (7) and remove any burrs if necessary. Grease bush (7) with white grease (Part No. II14525 or II32868).

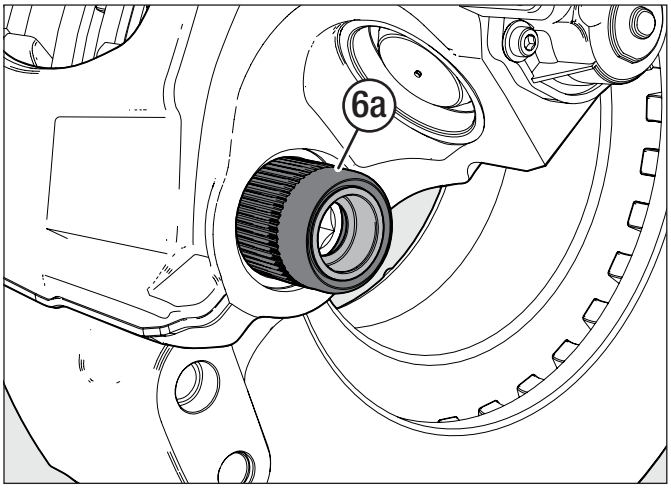


10.1.7 - 10.1.8 - Prevention of longitudinal displacement of brass bush

10.2 Bearing Variants (6) Replacement

For ease of reference, each component of a tool is referred to by an identification number e.g. (T28); a complete tool (containing one or more such components) has been given a letter code e.g. (**E**) - see section 2.1.

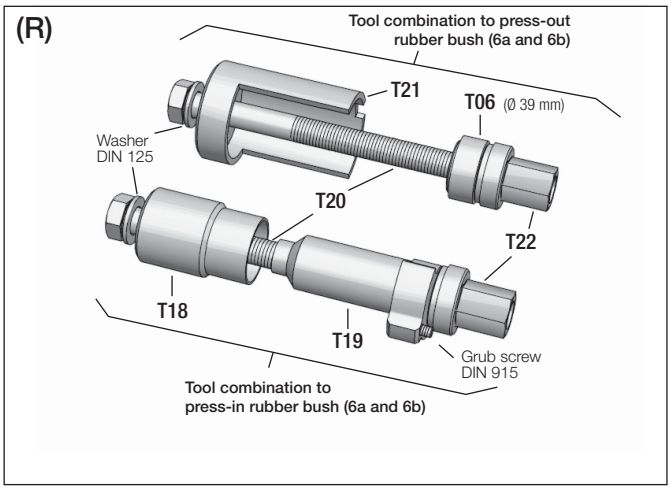
Bearing variants are: rubber bush (6a, 6b, 6d), guide sleeve (6c)



10.2 - Servicing of rubber bush (6a)

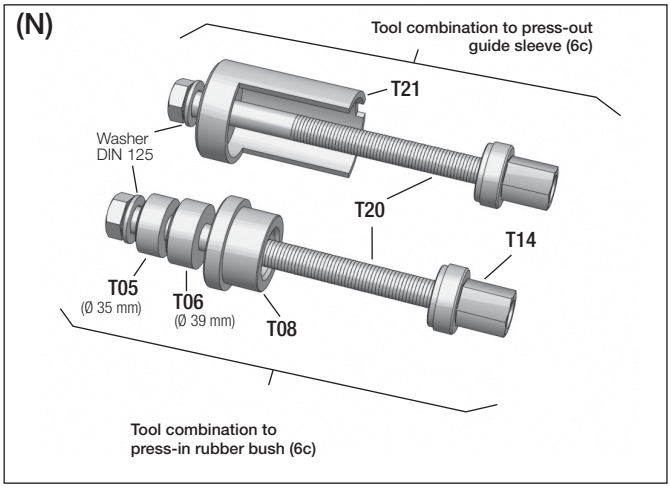
10.2.1. To replace the rubber bush the following tool combinations are used depending on the variant:

Rubber bush (6a and 6b) requires tool (**R**) for removal and assembly (see Fig.10.2.1.a).



10.2.1a - Tool (**R**)

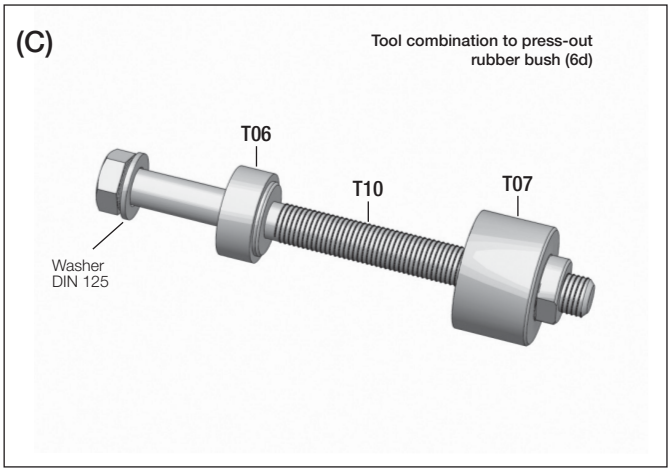
Guide sleeve (6c) requires tool (**N**) for removal and assembly (see Fig.10.2.1.b).



10.2.1b - Tool (**N**)

Rubber bush (6d) requires tool (**C**) for assembly only and fitted with (T06) instead of (T08) (see Fig.10.2.1.c).

Note: *The rubber bush (6d) is removed at the time the cover (68d) is removed (see Section 8.1.4). Therefore no special tool for the removal process is required.*



10.2.1c - Tool (**C**) with (T06) instead of (T08)

Removal of Bearing Variants (6)

Removal of Rubber Bush (6a or 6b)

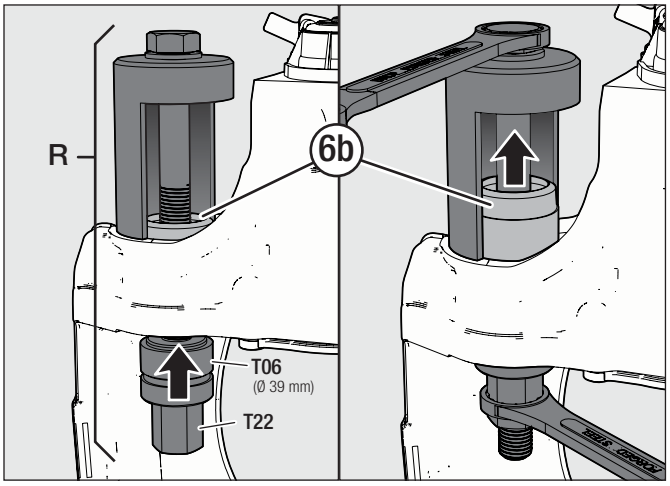
10.2.2. Remove guide pin (4a or 4b).

10.2.3. Clean the area around the bearing.

10.2.4. Select (T06) with Ø39 mm.

10.2.5. Place tool (**R**) in position on the caliper. Hand tighten (T22) (see Fig.).

10.2.6. Hold (T22) using a ring-spanner 24 A/F and pull-out the rubber bush (6a or 6b) by turning tool (T20) with a suitable tool (see Fig.).



10.2.5 - 10.2.6 - Removal of rubber bush (6b)

Removal of Guide Sleeve (6c)

10.2.7. Remove guide pin (4c).

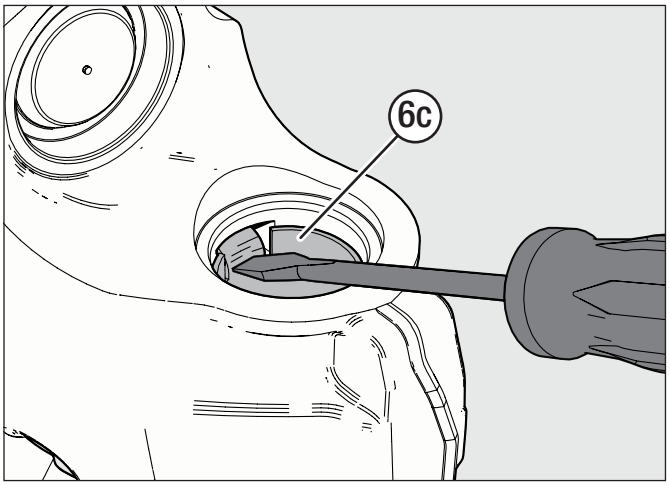
10.2.8. Clean the area around the bearing.

10.2.9. Use a suitable tool to separate the tab from the guide sleeve (6c) as described below:

The head of the tool should be slightly narrower than the tab and placed as close as possible to its base (see Fig.).

Then, separate the tab by striking the screwdriver in the direction of the tab.

10.2.10. Clean the area around the bearing and brake pads.



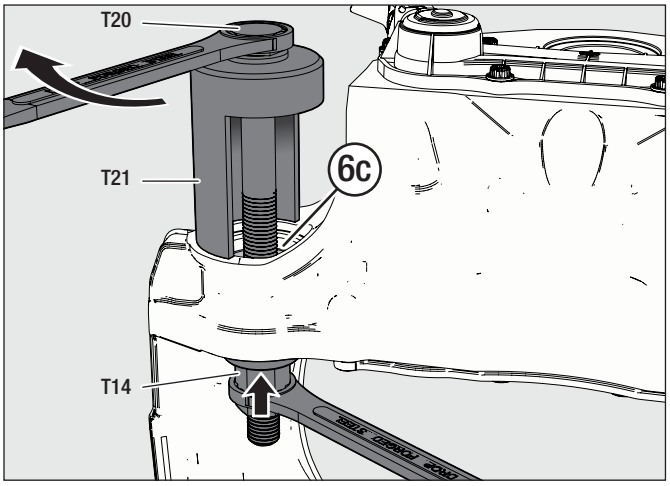
10.2.9 - Breaking off the tab from guide sleeve (6c)

Note: *The tab of the guide sleeve can be mounted in the bearing bore left or right.*

10.2.11. Position the tool (**N**) as shown (see Fig.).

10.2.12. Hand tighten (T14)

10.2.13. Hold (T14) using a ring spanner 24 A/F and pull-out the guide sleeve (6c) by turning tool (T20) with a suitable tool (see Fig.).



10.2.11 - 10.2.13 -Removal of guide sleeve (6c)

Removal of Rubber Bush (6d)

Note: *Rubber bush (6d) is removed when the cover (68d) is removed. Therefore no removal procedure or special tool is required.*

Fitting of Bearing Variants (6)

Fitting of Rubber Bush (6a) or (6b)

10.2.14. Check bore for corrosion and clean.

10.2.15. Wind out the grub screw (from (T19)) on the tool (**R**) so it **cannot** contact the caliper surface (see Fig. insert).

10.2.16. Push rubber bush (6a) or (6b) into (T18) of tool (**R**) (see Fig.).

10.2.17. Place tool (**R**) with assembled rubber bush (6a) or (6b) in position on the caliper as shown (see Fig.).

10.2.18. Hand tighten (T22).

Note: *Take care not to tilt the rubber bush* (6a) or *(6b) when winding in.*

10.2.19. Stabilise (T22) using an open spanner 24 A/F and using a torque wrench (max. **45 Nm**) turn (T20) to pull-in the rubber bush (6a) or (6b) until it stops (see Fig.).

⚠ *If the torque is **< 8 Nm** or **> 45 Nm**, then the caliper must be replaced.*

10.2.20. Remove tool (**R**).

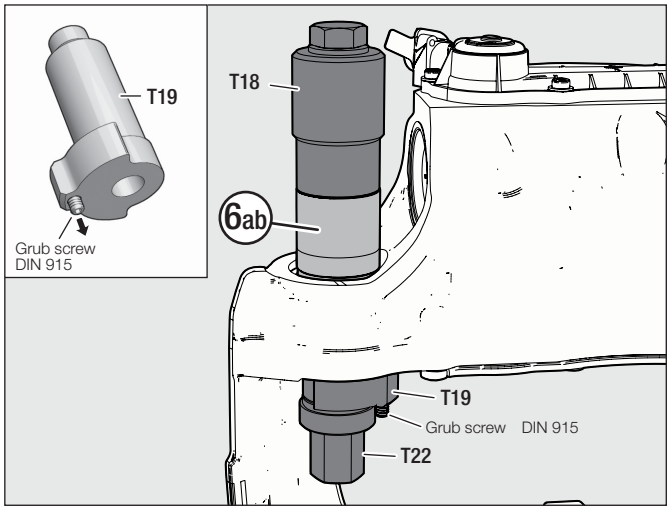
10.2.21. Check that the metal ring of the rubber bush (6a) or (6b) does not move (see Fig. arrow **A**).

⚠ *The metal ring of the rubber bush* (6a) or *(6b) must not move. When checking for movement, ensure that the sealing elements are not damaged.*

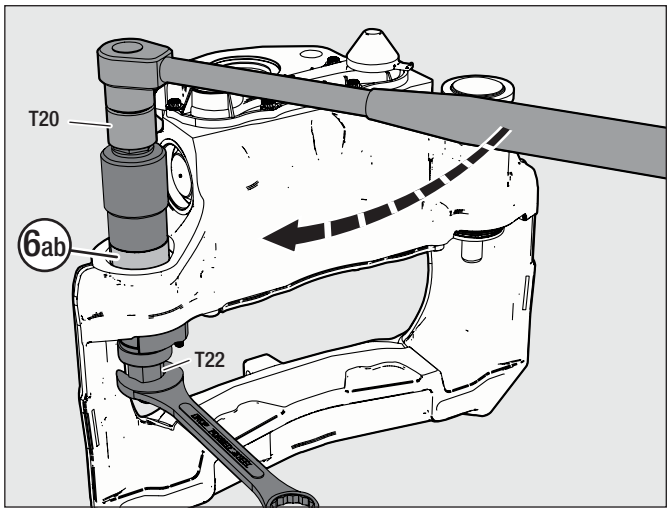
10.2.22. Grease inside the rubber bush (6a) or (6b) with white grease (Part No. II14525, II32868 or K93430).

⚠ *The guide pins (4a, 4b and 5) as well as the caliper bolts (39 and 40) are highly stressed items. They must be replaced whenever the caliper (1) is removed from carrier (2).*

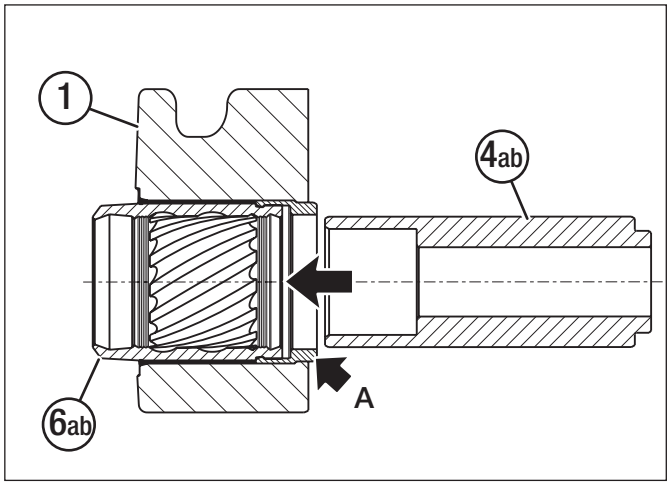
10.2.23. Fit guide pin (4a) or (4b) via the pad abutment in the rubber bush (6a) or (6b) (see Fig.).



10.2.16 - 10.2.18 - Rubber bush and tool combination (**R**) in situ



10.2.19 - Pull-in rubber bush - max. torque **45 Nm**



10.2.21 - 10.2.23 -Check rubber bush, fit guide pin

Fitting of Guide Sleeve (6c)

⚠ *The guide sleeve (6c) must be positioned so that its tab and the groove in the caliper bore are aligned.*

Note: *Caliper groove can be on the left or right side of the caliper bore.*

10.2.24. Place (T14) onto the aligned guide sleeve (6c) and lightly tap with a hammer to make sure it is seated correctly in the caliper bore (see Fig.).

10.2.25. Complete the positioning of tool (**N**) through the caliper bore and guide sleeve (6c) (see Fig.).

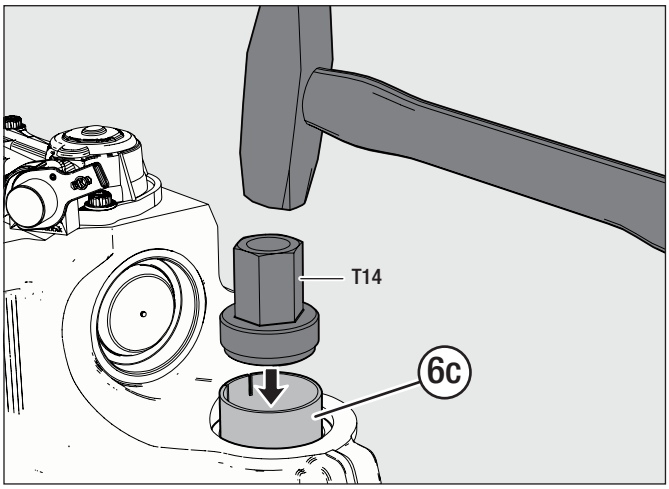
10.2.26. Hand tighten spindle (T20).

10.2.27. Stabilise spindle (T20) using a ring spanner on (T14) and by using a torque wrench (max. 18 Nm) turn the spindle (T20) to pull-in the guide sleeve (6c) until it stops (see Fig.).

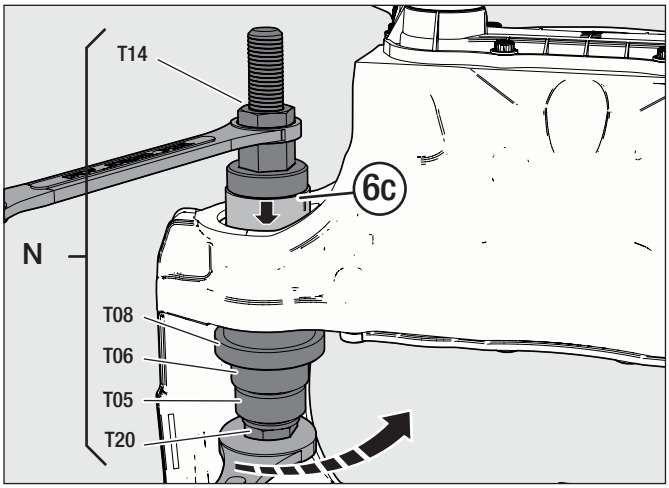
⚠ *If the torque value is < 4 Nm or > 18 Nm, the caliper must be replaced.*

⚠ *Do not turn (T14) as this may cause the guide sleeve (6c) to turn and lose its alignment with the groove in the caliper bore.*

Remove all assembly tools.



10.2.24 - Guide sleeve (6c) lightly tapped in position



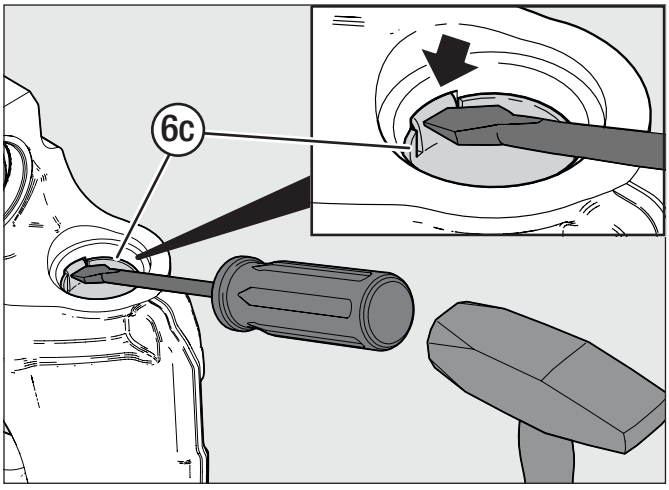
10.2.25 - 10.2.27 tool combination (**N**) in position

10.2.28. Press in the tab of the Guide Sleeve using a screwdriver or similar tool whose width is smaller than the tab. Place the screwdriver as close as possible to the top of the tab and bend the tab into the groove of the caliper (see fig.)

The Guide Sleeve (6c) is now secured against rotational and axial movement.

Grease inside the Guide Sleeve (6c) with white Grease (Part No. Il14525, II32868 or K093430).

Fit Guide Pin (4c).



10.2.28 - press in the tab of the guide sleeve

Fitting of Rubber Bush (6d)

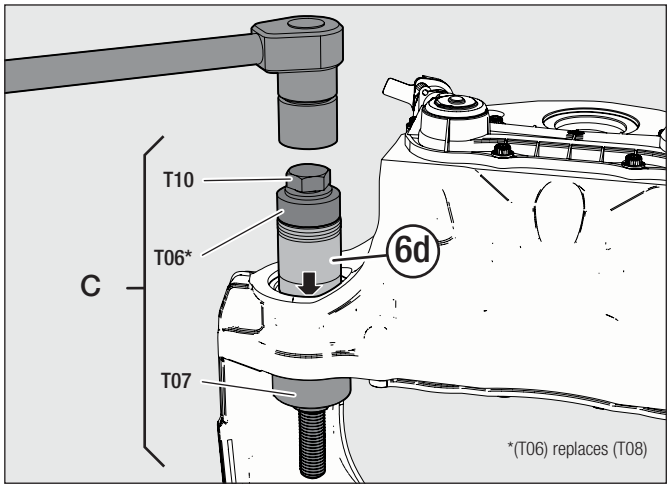
10.2.29. Clean the area around the bearing.

10.2.30. Place rubber bush (6d) onto (T06) (which replaces (T08) of tool (**C**)).

10.2.31. Bring the rest of tool (**C**) into position.

10.2.32. Using a torque wrench turn (T10) to pull-in the rubber bush (6d) until it stops with a torque between **8 Nm - 30 Nm** (see Fig.).

⚠ *If the torque value is **< 8 Nm** or **> 30 Nm** the caliper must be replaced.*



10.2.31 - 10.2.32 Tool combination (**C**) with (T06*)

10.2.33. Remove tool (**C**)

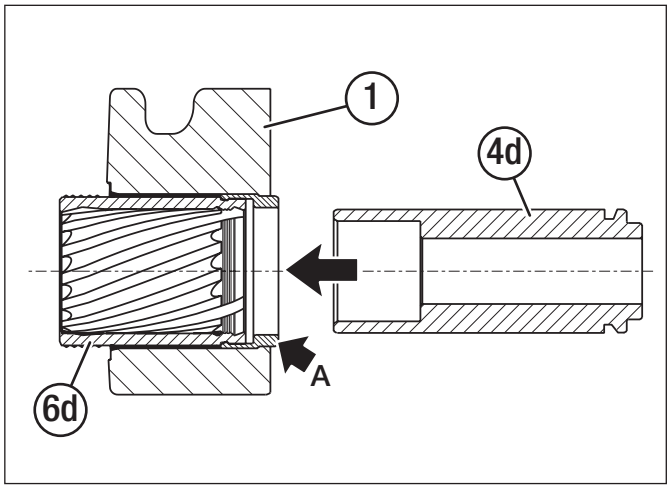
10.2.34. Check that the metal ring of the rubber bush (6d) cannot move (see Fig. arrow **A**).

⚠ *When checking for movement, ensure that the sealing elements of the rubber bush (6d) are not damaged.*

10.2.35. Grease inside the rubber bush (6d) with white grease (Part No. Il14525, II32868 or K93430).

⚠ *The guide pins (4a, 4b and 5) as well as the caliper bolts (39 and 40) are highly stressed items. They must be replaced whenever the caliper (1) is removed from carrier (2).*

10.2.36. Fit the guide pin (4d) into the rubber bush (6d) via the brake pad bay area (see Fig.).



10.2.34 - 10.2.36 - Check metal ring, insert guide pin (4d)

11 Carrier Replacement

Depending on the installation, it may be possible to remove the caliper from the carrier and replace the carrier in situ. Else it may be necessary or more convenient to remove the complete carrier/calliper assembly from the vehicle where it can be separated and the carrier replaced.

Note: *The disc brake is very heavy, take great care in handling!*
Do not fasten any lifting device to the pad retainer (11) since this can be damaged.

Note: *The carrier is fitted to the vehicle according to the vehicle manufacturer's specifications and with bolts supplied by the vehicle manufacturer – they are not available from Knorr-Bremse.*

See section 8 as applicable:

Either:

11.1 Remove caliper from carrier.

11.2 Replace carrier – ensure new bolts and correct torques are used.

11.3 Refit caliper to carrier.

Or:

11.1 Remove caliper/carrier assembly.

11.2 Replace carrier.

11.3 Refit caliper/carrier assembly – ensure new bolts and correct torques are used.

12 Brake Actuator Replacement

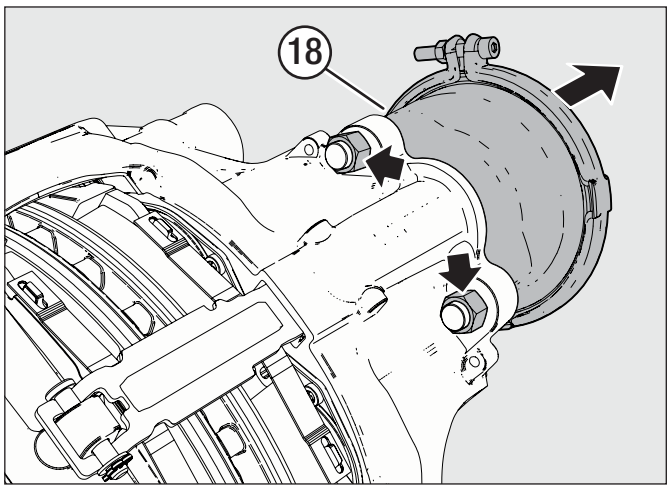
Note: *All references to brake actuators (brake chambers and spring brakes) in this section refer to Knorr-Bremse brake actuators. For other brake actuator manufacturers, follow their respective instructions.*

12.1 Removal of Knorr-Bremse Brake Chamber

12.1.1. Disconnect air connection from brake chamber (18) – **take care**, air connection must be free of air pressure!

12.1.2. Unscrew brake chamber mounting nuts and remove brake chamber (18) (see arrows in Fig.).

⚠ *It is not allowed to reuse the nuts of the brake chamber (18).*



12.1.2 - Brake chamber removal

12.2 Fitting of Knorr-Bremse Brake Chamber

Note: *New brake chambers (18) have drain plugs installed (see arrows **A**). Remove lowest plug (as viewed when brake chamber is installed). All other drain holes should be plugged (refer to the vehicle manufacturer's recommendations).*

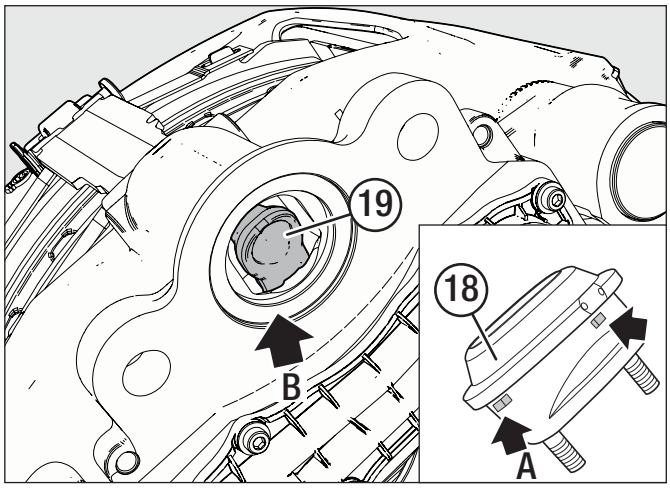
12.2.1. The sealing surface and the flange surface (see Fig. arrow **B**) must be:

- free from dust and corrosion
- free from damage
- flat

Take care that no dirt enters the brake caliper!

12.2.2. Before fitting the new brake chamber, the spherical cup (19) of the lever and the sealing surface of the caliper must be greased with white grease (Part No. II14525 or II32868).

⚠ *Do not use grease containing molybdenum disulphate. Use only actuators which are recommended by the vehicle manufacturer.*

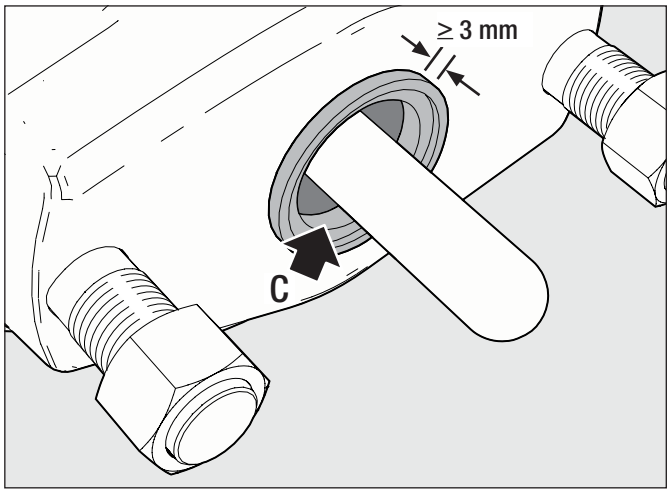


12.2.1 - 12.2.2 - Check seal and flange surface of caliper, grease spherical cup and flange surface

12.2.3. The seal, as well as the push rod area of the brake chamber (18) (see arrow **C**) must be clean and free of lubrication.

The seal must not show any signs of damage.

Note, if the brake chamber's seal protrudes less than **3 mm** the brake chamber must be replaced (see Fig.).



12.2.3 - Check seal, min. **3 mm**

12.2.4. Attach brake chamber using new nuts (see Fig.).

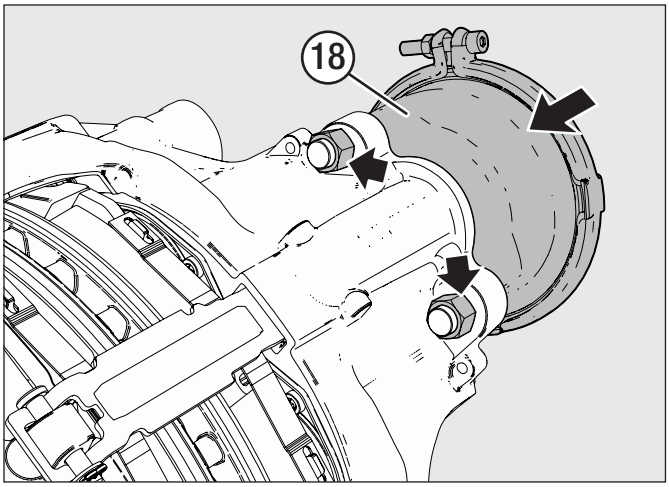
In order not to tilt the brake chamber during its attachment, the nuts must be gradually tightened symmetrically with a suitable tool.

12.2.5. Then tighten the nuts according to the specifications of the actuator manufacturer

12.2.6. Connect air hose, making sure that the hose is not twisted and chafing is not possible.

12.2.7. Check air connection for leakage.

⚠ *Check function and effectiveness of the service brake system.*



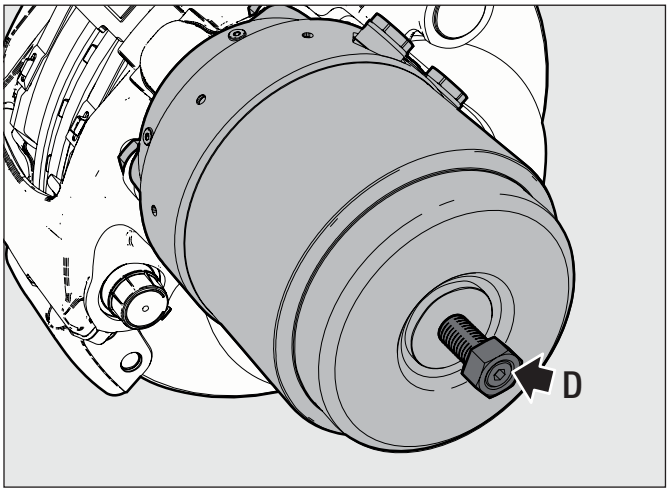
12.2.4 - Attach brake chamber

12.3 Removal of Knorr-Bremse Spring Brake

⚠ *Chock wheels before releasing spring brake to ensure the vehicle cannot roll away.*

12.3.1. Release parking brake.

12.3.2. Screw-out release bolt (arrow **D**) to the release position (refer to the vehicle manufacturer's recommendations) (see Fig.).



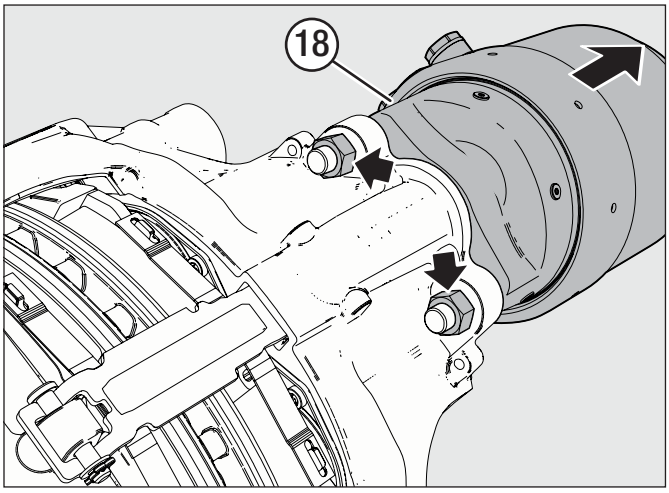
12.3.2 - Screw out release bolt

12.3.3. Apply parking brake.

12.3.4. Disconnect air connections from spring brake (18) – **take care**, air connections must be free of air pressure.

12.3.5. Unscrew spring brake mounting nuts (see arrows) and remove the spring brake (18) (see Fig.).

⚠ *It is not allowed to reuse the nuts of the spring brake (18).*



12.3.5 - Knorr-Bremse spring brake removal

12.4 Fitting of Knorr-Bremse Spring Brake

Note: *New spring brakes (18) have drain plugs installed (see arrow **A**). Remove lowest plug (as viewed when spring brake is installed). All other drain holes should be plugged. Refer to the vehicle manufacturer's recommendations.*

12.4.1. The sealing surface and the flange surface (see Fig. arrow **B**) must be:

- free from dust and corrosion
- free from damage
- flat

Take care that no dirt enters the brake caliper!

12.4.2. Before fitting the new spring brake, the spherical cup (19) in the lever and the sealing surface must be greased with white grease (Part No. II14525 or II32868).

⚠ *Do not use grease containing molybdenum disulphate. Use only actuators which are recommended by the vehicle manufacturer.*

12.4.3. The seal, as well as the push rod area of the spring brake (18) (see arrow **C**) must be clean and free of lubrication.

The seal must not show any signs of damage.

Note, if the spring brake's seal protrudes less than **3 mm** the spring brake must be replaced (see Fig.).

12.4.4. Attach the spring brake using new nuts (see Fig.).

Note: *In order not to tilt the spring brake during its attachment, the nuts must be gradually tightened symmetrically with a suitable tool.*

12.4.5. Then tighten the nuts according to the specifications of the actuator manufacturer.

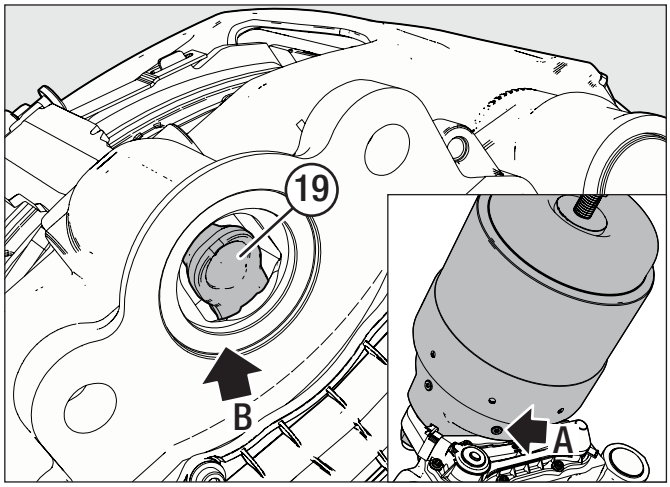
12.4.6. Connect air hoses, making sure that the hoses are not twisted and chafing is not possible.

12.4.7. Release parking brake.

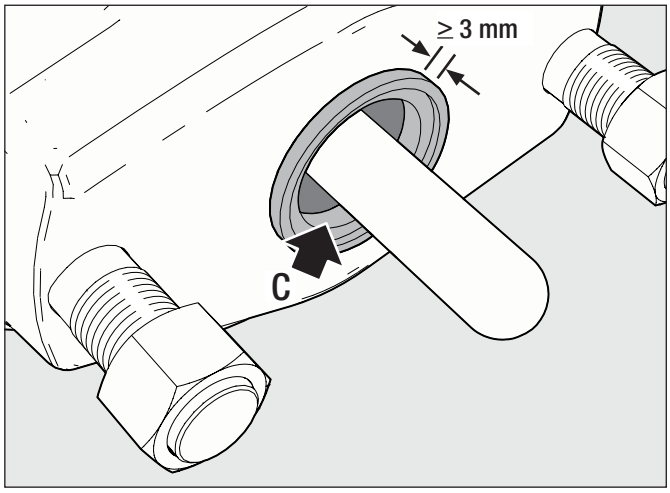
12.4.8. Screw in spring brake release bolt as per instructions on the spring brake itself.

12.4.9. Check air connections for leakage.

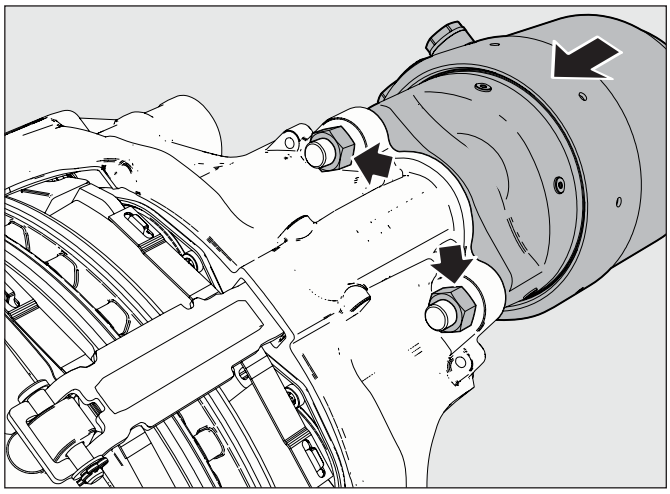
⚠ *Check function and effectiveness of the service brake system and parking brake system.*



12.4.1 - 12.4.2 - Check seal and flange surface of caliper, grease spherical cup



12.4.3 - Check seal, min. **3 mm**



12.4.4 - Knorr-Bremse spring brake fitting

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